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BIMarabia

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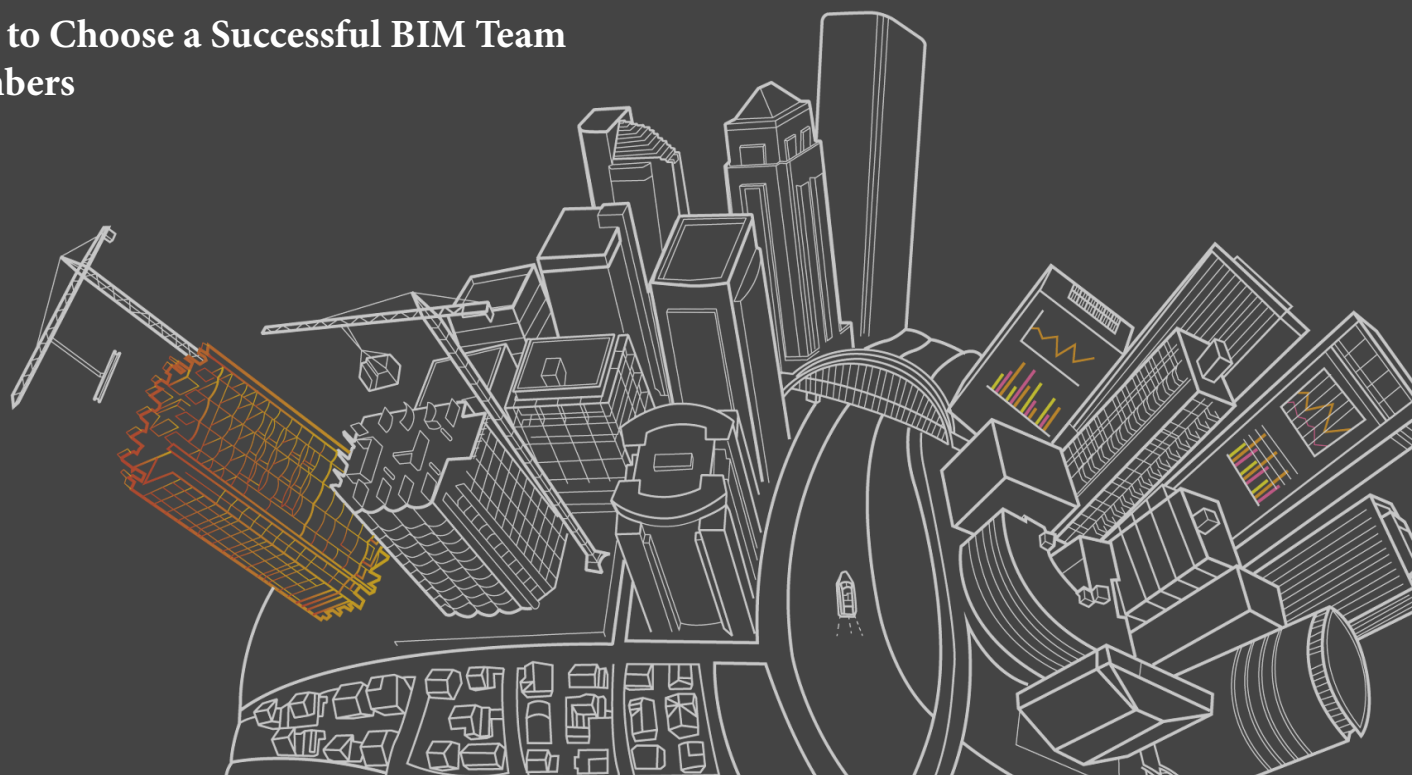

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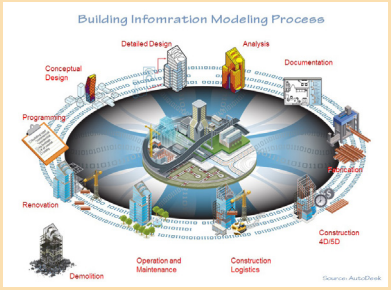

Team Work:

Omar Selim
Eng. Sonia Ahmed
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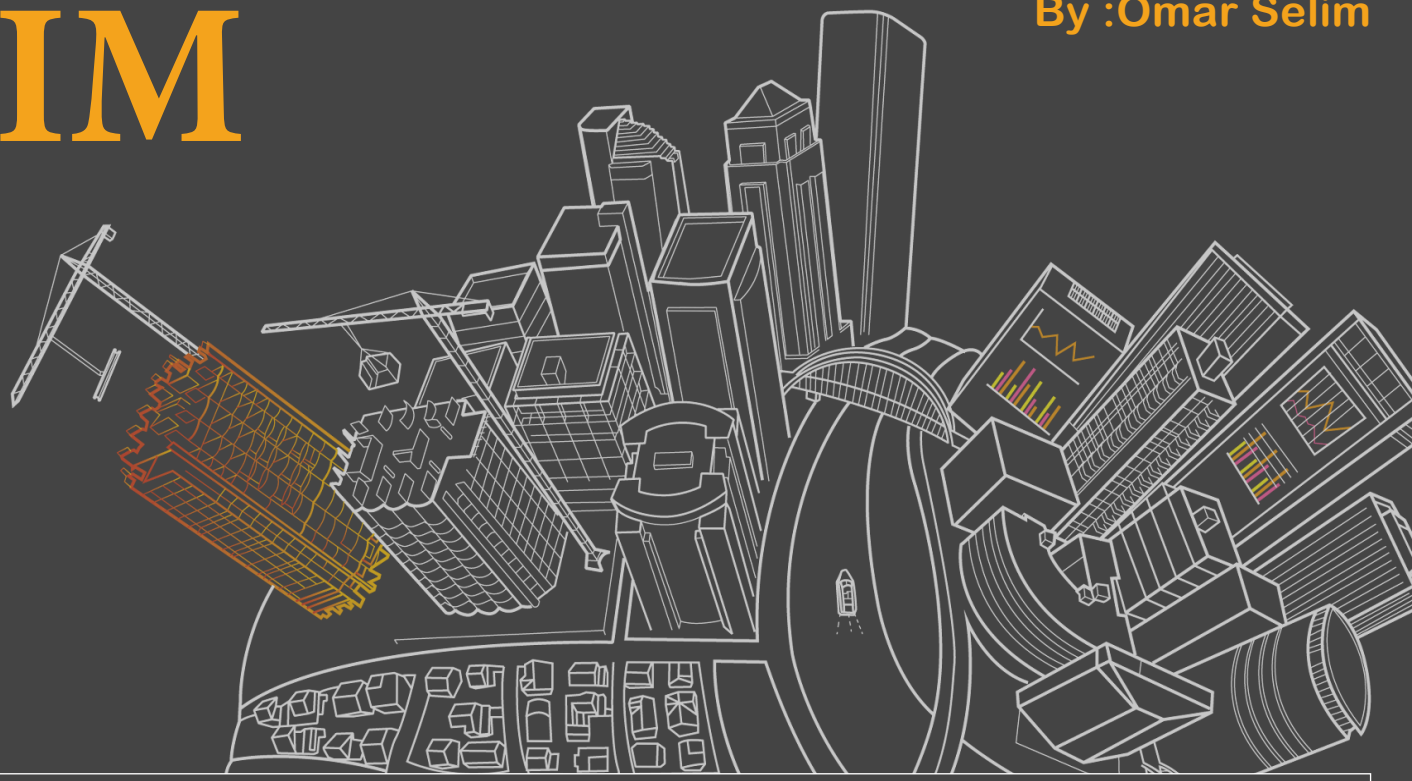
Eng. Maisoon Alsorori

BIM

By :Omar Selim



How to be professional in BIM?

BIMarabia continues with favour of Allah, then with your support.
A question always asked to the magazine, how to become a professional BIM?
BIM is divided into two parts: a theoretical part and a practical part.
Theoretical part, the concept of BIM is a comprehensive development system based on technology, processes, human beings, levels and important codes, in the magazine "BIMarabia" we work hard to explain everything related to it.

Practical part: Work at least in one program that achieves BIM, and you will find a lot of courses and ectures, we in the magazine explain what is hidden and soon we will provide a lectures library for best explanation of programs.

First you have to learn the two parts. Theoretical without practical part may help if you are an academic, while practical and without Theoretical part makes you modeller who works on a three-dimensional CAD
After this you have to work with a team in more than one project and look for solutions to problems that you would face.

Choosing a program depends on the company you are working on "or the famous program in the market ". If the company is working with program" A ", you will have to learn it and work with the team and Moving to another program would be collective decision, end then the progress of the work will tell you what to learn next.

We hope that Allah will accept and fulfill our mission to help in raising the efficiency of the Arab Engineer.

Building Information Modelling VS Partial Building Information Modelling

According to the graphic language illustrated in Figure 3.1 (Episode 3), as shown below

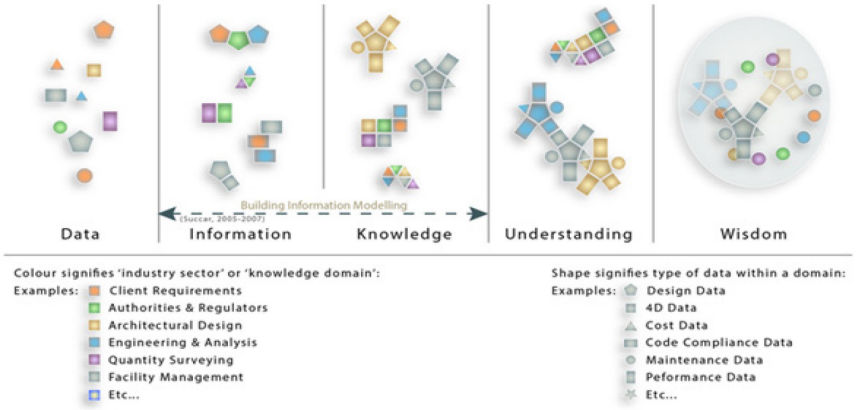


Figure 3.1: The information realm of BIM

A Building Information Model comes into digital existence whenever the main model includes different types of data; information generated in two or more disciplines or domains. In case of lack of any data mentioned previously, the model can only be called a partial BIM. Deeply, partial BIM is when the model includes same data; data is generated within the same discipline or domain. More specifically, the full building information modelling BIM must only be granted to models/processes that include multiple data types. As an example that apply this meaning of BIM, an architectural firm that uses ArchiCAD, Revit, or Bentley Architecture to create its design model cannot mark its activity as BIModelling unless it shares the model (or part of it) with an engineer or a builder. Similarly, those firms are using BIM for having faster and better coordination for 2D documentation, in fact, those firms were just using only partial BIM.

Substantially, BIM is a process more than being a technology. (More information in the following episode)

EPISODE 5:

Written by: Dr. Bilal Succar

BIM data sharing methodologies

BIM modellers can share little or much information that is available across industry domain. The optimal BIModellers have the ability to display, calculate and share all data that is necessary between disciplines without any loss or clashes in workflow. This ability or lack of, is part of the function of the technology used, the publishing process, and the elements (knowledge workers involved).

Assume that each domain (industry sector: Architect, consultants or constructors) is using a different BIM program, data sharing methodologies among them will take many forms:

Data Exchange: Each BIM modeller will preserve the model but some information need to be export to be shared with others while those other BIMmodellers can import and calculate (XML, CSV or DGN for example). This method suffers from the highest data loss rates accidentally. Data loss indicates the amount of data that can't be shared comparing to the overall data available in model. However, not all data must be shared between Modellers all the time.
Partial Data Exchange (compared to unintentional data loss) can be an intentional and efficient method of data sharing.
Data harmony: harmony can be in many forms; the one that will be discussed here is just an example.

Assume file based on data harmony (not based on a server) one of the demonstrated scenarios for this data sharing methodology is as follows:
BIModeller 1 produces an IModel that is imported into BIModeller 2 where its worked-on then exported into IModel v2 (version 2) that is imported into BIModeller 3 where its worked on then exported into IModel v3 that is imported into…[2]

The amount of data lost/gained between modellers, models and model versions depend on modellers' import/export abilities and its harmony, for example (IFC or CIS/2). One major flaw of this file is workflow linearity; the inability to allow concurrent changes to the shared.

Data unity: linking files is good example of data unity: data in one model is linked to data in another model. The files are neither imported nor exported but BIM programs can read and calculate the data embedded within the linked files. The amount of data loss depends on the amount of data readable or calculable. Referential Models (RModels) are another example of BIM Data unity. RModels are single or integrated models that host links to outside data sources; like a hyperlinks on a webpage. An example of this would be a virtual building with a referential window object: detailed information (values) beyond the basic parameters are not saved within the BIModel but are accessed from an external source whenever needed [3] (ex: currently, window cost, availability, installation guide, maintenance schedule).

Data Integration: integration may be understood in many ways including the lowest ability level to exchange data between software solutions. In a BIM meaning, an integrated database signifies the ability to share information between the different industry sectors using a common model [4]. The shared data within the model may be architectural, analytical (engineering) or administrative like design, cost or code information (indicated in Episode 4). The important thing about an Integrated BIModel is involved in locating information let them interact with each other within a single framework. At this time, few if any available BIModellers can integrate the necessary data and processes needed to achieve an integrated model (A model of a set of data is an interpretation that all are true [5].

Data Sharing Hybrid: A combination of any data sharing forms discussed above. Most BIM modellers, whether owners or not, coordinate the multi-disciplinary information generated by AEC sectors through hybrid of information sharing methodologies.

What is API and Why it is Important?

Written by: Mostafa Khalil
Translated By: Khalid Othman

A lot of colleagues and friends asked me about API and its importance. I liked to make this topic simpler for those who don't know it and for those who have an idea about it.

API is simply a communication path between one program and another. API stands for Application Programming Interface. This tool is not new, but it is found in many programs. For example, you can copy information and data from Excel and paste it in Word though having different programs.

Currently, API is widely used in Internet where the user can insert any program and attach with it its specific website. For example, Google Map or Google Drive can be inserted in internet website though having different cods for each program.

But how the communication is created between programs with different codes? This is done in the basis of the program. So if we want to communicate with Revit from an external program, there must be communication channels and without them you can't reach the program and communicate with. As a result, communication points are created and can be metaphorically called as gates to enter the crux of the program. And surely these gates give limited permission which means they let the programmer to enter to a specific part in crux of the program for certain tool. With scientifically explanation, API let the exterior world use some of tools in the main program with limited framework. And this let the communication between different programs as shown previously without the need of programmer to write long codes for doing same job.

However, what will be the damage created from API? Actually, it differs from one program to another. For example, if a program is written to work in Revit in a way to convert model A to model B and an error occurred by not converting to model B but model C. in Revit, you can go a step back by CTRL + Z so you can use this program safely but in case of Excel, if you write Macro for doing certain task there is no backward step.

Examples on Revit, I wrote certain programs that can save time for the user or the programmer, for example:

Auto Join: connect elements together.
https://moustafakh.wordpress.com/2014/09/14/auto-join-all/

Export Kit: this can help to print all the project sheets in the user form without the need to sit next to the computer waiting to print each sheet.
https://moustafakh.wordpress.com/2015/10/20/export-kit/

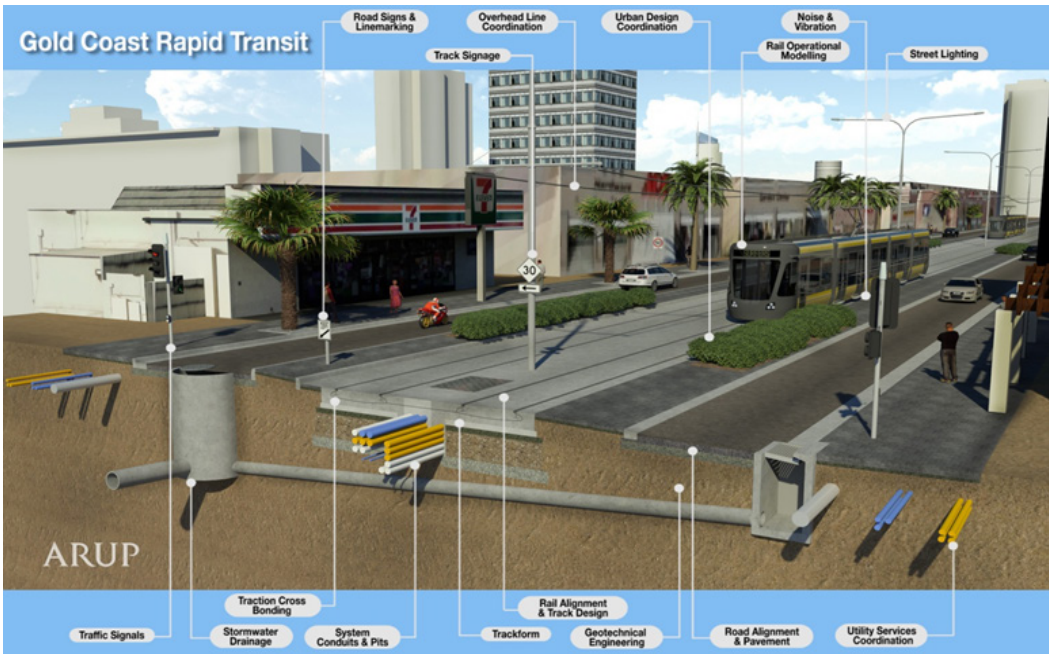
Bim Usage to Model the Existing Infrastructure for Projects

Written By:
Ayman Kendeel

Translated By :
Mohammed Ghattas

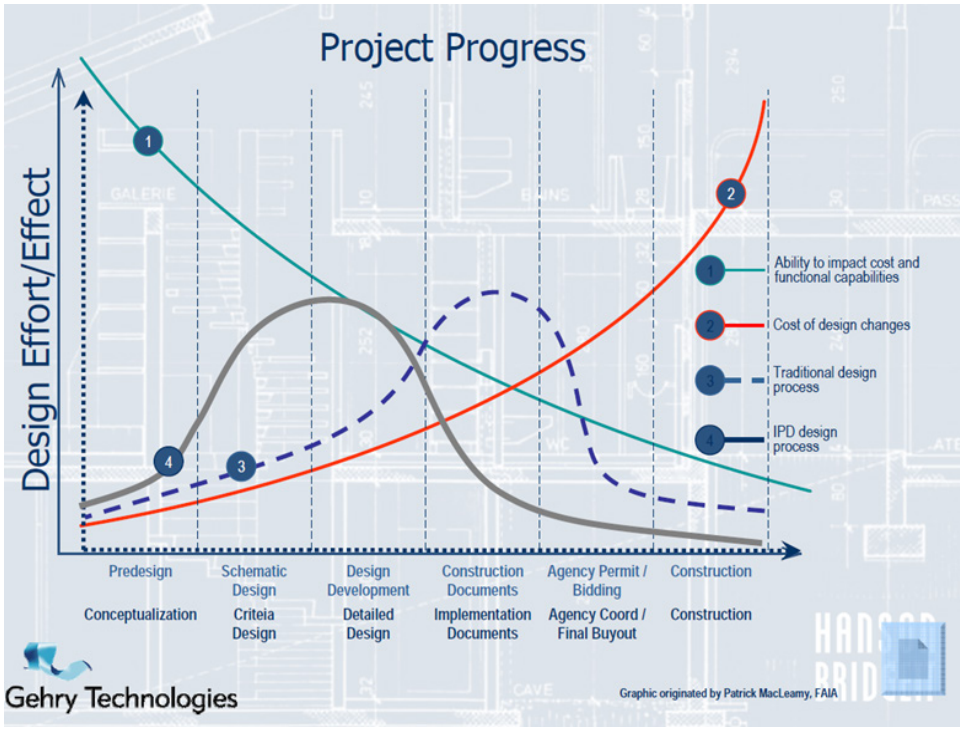
What is the existing infrastructure for projects?

Existing infrastructure projects can consist of simple utilities which face designers during the expansion of an existing building or expand to a huge utilities networks which face designers when designing a complete infrastructure network for a city. Most of these designs may be based on beliefs and guesses due to the lack of complete information and documentation of those services which can serve designers in the BIM model. Therefore, the management of infrastructure projects based on the existence of current utilities networks is difficult to deal with, especially in the absence of information. The idea of solving the problem from the perspective of BIM is to document all the existing services and give them the actual characteristics (dimensions - materials - Levels - etc.), which allows designers to deal with the existing utilities infrastructure an intelligent elements and a part of the model.



Can designers apply BIM to existing infrastructure projects?

Project owners seeking the lowest risk possible when implementing the project, which requires the necessity of predicting and correcting the status of the site so as not to be a surprise during construction. One of the BIM objectives is reducing the costs of design change and imitate changes in the pre-construction phase as shown in the below figure.



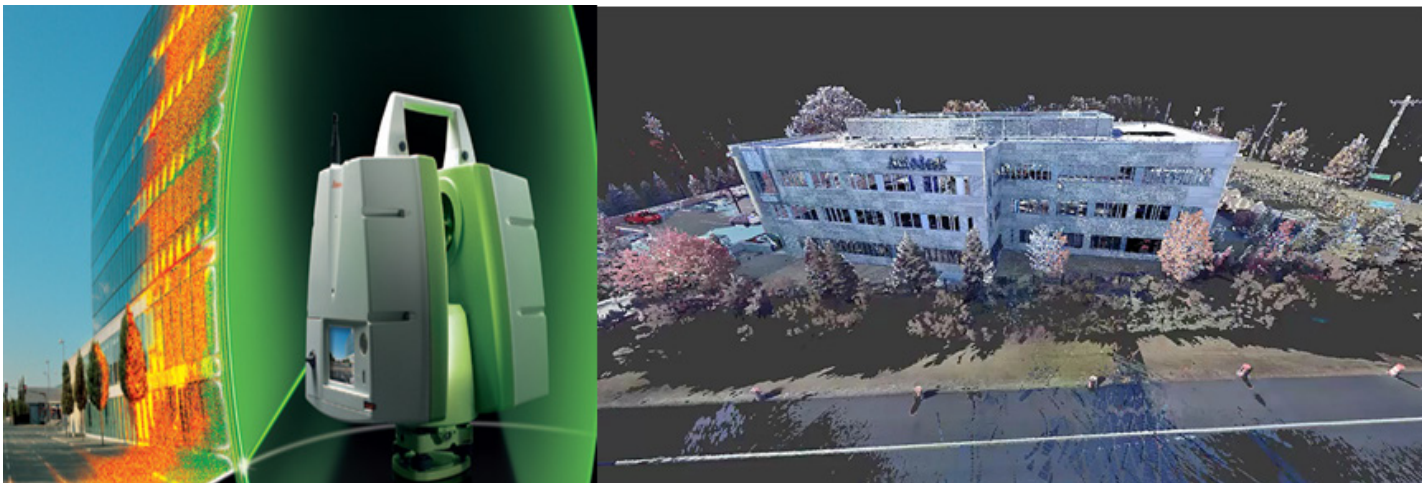
So BIM if correctly implemented in modeling the existing infrastructure can help predicting:

1. Where are risks?
2. Changes in design before construction phase.
3. Quantity survey and cost control according to the existing infrastructure.
4. Achieving beneficial integration results especially in the construction phase.
5. Achieve the correct path of the new infrastructure utilities design to serve them and does not conflict with the existing one.

"If a building is worth building, its worth building twice, one digitally during the design process and again physically during the construction process"

How to represent existing infrastructure elements for projects?

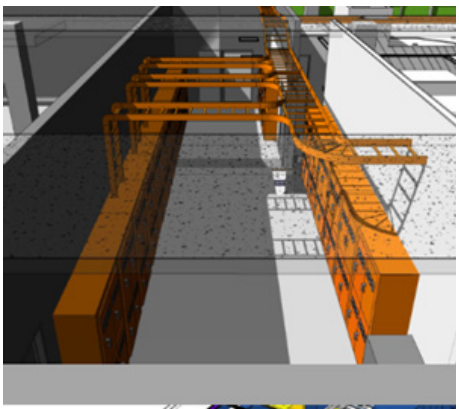
This can be achieved through traditional methods by collecting data and as built drawings, and prepare drawings to be used in BIM, This method depends on the accuracy of the information and the implementation according to those plans, which may be required to modify the existing designs to achieve better standards of accuracy.
It may require to use one of the modern technology methods to obtain a comprehensive survey of the current situation, but disadvantages are high costs and special technology is required such as laser scanning.
The point is to compile a three-dimensional matrix of all the points that collide with the laser beam and forms a network of the points to form the current situation and it is very effective in complex details.



BIM application results in the existing infrastructure:

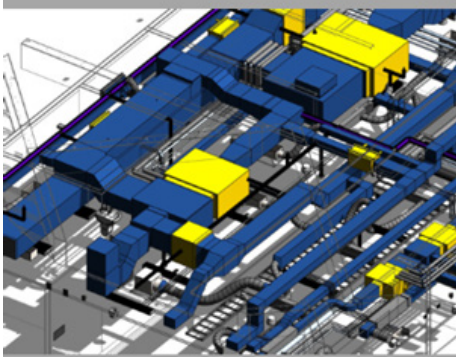
I. Design stage:

a. Ease to export all data and details of the model.
b. Extracting data from the approved model reduces the probability of errors.
c. All data are available for all disciplines at the same time.
d. Ease of review procedures to achieve efficiency throughout the design cycle.



II. Construction stage:

a. Ease of quantity surveying and invoices preparation.
b. Integration with design during construction.
c. Flexibility of work and provide alternative solutions during construction.



Infrastructure projects and Autodesk Infraworks 360™ software

To start using BIM on infrastructure projects, you need to start by creating a model of the current conditions which can help accelerate the entire project. In contrast with conventional drawing, which often lack sufficient detail to contribute to later stages of projects in the BIM process, the existing infrastructure model should be three-dimensional with all the descriptive information of the elements such as (depth, height, diameter, material) and all required data.

The process of creating a model for the existing structure in Autodesk 360 Autodesk ™ is simple and quick. Once you have chosen the place to study and start the preliminary study of the design proposals, the program can give you a topographic surface of the area under study by using an accurate aerial images from Bing maps as well as all existing roads, railways, buildings and water surfaces through model builder feature in 360 versions, Program named due to its strength in modeling the reality, the schematic design and decision support for roads, bridges and drainage.

The program enables you to add all the other designs, water and drainage systems, residential buildings and facilities that are being designed and to create a real environment of the project by adding smart elements that give the spirit of realism of the model and this strong technology considers an important element towards moving to a better future in the smart cities.

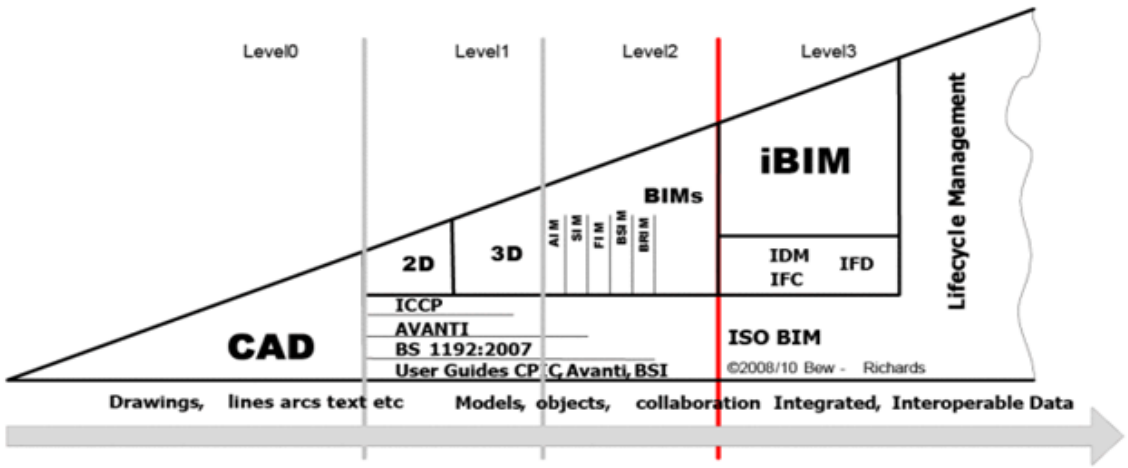
BIM Maturity Levels Model, Analytical Look

Written by: Eng. Tamer Abdulaqader

Translated by :Sara Marashly

I don't believe there is any BIM expert who have not seen the specification of British Standard Institution for BIM which is known as PAS 1192, especially PAS 1192-2:2013 that is considered one of the main specification in BIM field and its importance is due to its precise description of data that result from following BIM requirements. As well as for illustrating BIM maturity levels as shown in the figure below. BIM maturity levels are similar to assessment of level understanding and BIM application for institutions working design and construction field. And BIM capability assessment is considered one of the requirements for most projects because it confirms the possibility of project construction in a way compatible with BIM requirements. The assessment will be done by selecting the maturity level that is suitable with the working steps taken in the institution. However, the maturity levels, currently, are just for guiding purposes. Recently, Building Research Establishment – BRE started evaluating some western institutions and qualifying them to be institutions that are compatible with the second level of BIM. In addition, there are several efforts for granting certified certificates for BIM administration on individual level like the one granted by the royal British institute, Royal Institution of Chartered Surveyors, for surveyors.

Away from all the above, why do not we look at this figure to contribute to critical and analytical study for the maturity levels model in my humble opinion.



As a summary, the above figure is supposing that there are four separate BIM maturity levels, starting from level 0 (unmanaged CAD) which is completely paper-based work environment and the use of CAD to generate 2D drawings with some coordination done by hand. And there is not any correct path for the specification in generating drawings. Then level 1 of BIM maturity where some specification arise for example; Avanti, PAS 1192, ICCP. This level used for 2D and 3D drawings but without any integration of calculations and cost. This level is followed by level 2 of BIM maturity which set as target for most authorities by 2016 and known as proprietary BIM which needs to follow certain specifications and design codes and records employer information requirements. It also look for integrated work environment or associated programs. Then the higher level which is the integrated BIM that can let all the project parties to work in the model and update it at the same time through the same program with following the required specification and codes. This is just a summary, and there are different references and more detailed explanations in BIM maturity levels for those who want to understand the levels fully. I nominate A Report for the Government Construction Client Group BIM Working Party Strategy Paper.

Let's suggest some examples on the previous sample:

1. If the design consultant is using 2D CAD program with following the specification of 2D data and link the CAD files with external referencing so which level is it classified? Level 0, 1. Or 2?

2. If the design contact is using BIM but in limited way, just for clash detection and resolution. So is this classified as level 1 or 2?

3. If the consultant is forming designs that are compatible with BIM but he/she did the quantity take off manually, then the contractor had extracted the shop drawings as CAD files and then dealt with supplier who use programs not integrated with CAD or BIM. So in which level are classified all of this?

In addition to the above, there are several examples that are hard to be classified under any BIM maturity level and this is because the workflow is more complex than the above classification. Will you be in level 2 if Revit and Navisworks were used? And are you in level 1 if CAD, 3D Civil, or microstation was used? The answer is: not necessary because simply there is not a clear line that if you cross it you will be in a certain level! But there are several practices, work steps, and specifications that are followed gradually to increase awareness and subsequently the maturity level. And in many cases you face a contradiction with the market or owner requirements or funding problems which make access to the target level hard to be achieved. Also there are the project needs which may ask for more or less detailed requirements for the model. That is why partial BIM maturity level will be sufficient, which I think it includes most of the parties working in construction field even of those parties affirm their conformity with all requirements for certain maturity level.

In addition to the weak points of the previous BIM maturity levels is setting CAD program as a barrier or BIM undeveloped level due to its position in either level 0 or 1. This is incorrect because CAD can be integrated with many additions to reach very advanced level of intelligence which reaches or overcome BIM programs. So I believe that BIM maturity levels cannot be supported by the use of certain technique or programs but by the availability of certain specification, work steps, and specific data.

So I tried to create another model for classifying BIM maturity, in my humble opinion, being more realistic and flexible than the previous model. It is known as Quadrant Model. It measures BIM maturity through four criteria that interact together in varying degrees without depending on certain technique. These criteria are:

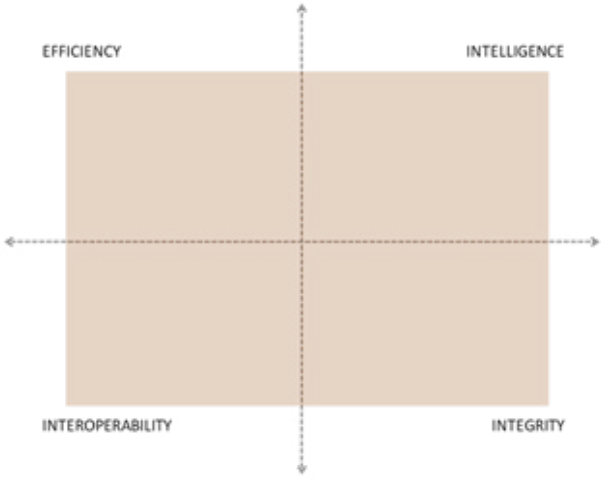
1. **Integrity:** in which BIM cover the whole project stages. The integration is supported by the availability of product data and its types in each stage of the project life cycle, where the maturity of this criterion needs description of data production in a stage before design thoughts like completing all the owner, design consultant, and supervisor requirements and description of the different model outputs through determining level of development and their reflection on all the project documents for example BIM procurement and project implementation plan, passing through detailed design and up to the commissioning, maintenance, renovation, or destruction stage. So to achieve this criterion, the project needs to be developed throughout its lifecycle and all project stakeholders need to participate.

2. **Interoperability:** the capability of data exchange between different parties. And this depends on the flexibility between the concerned parties without any difference or lack of any project data. To achieve this criterion, certain specifications must be followed, like data format, spatial coordination, and metadata, and master information delivery plan, common data environment, and BIM execution plan and clear criteria for file naming and layering convention must be done.

3. **Efficiency:** the amount of resources needed for the model and data production. This criterion depends on the speed and efficiency of model production and extraction of data in automatic way through using programs that need the least human resources and economic resources taking into account the most precise details.

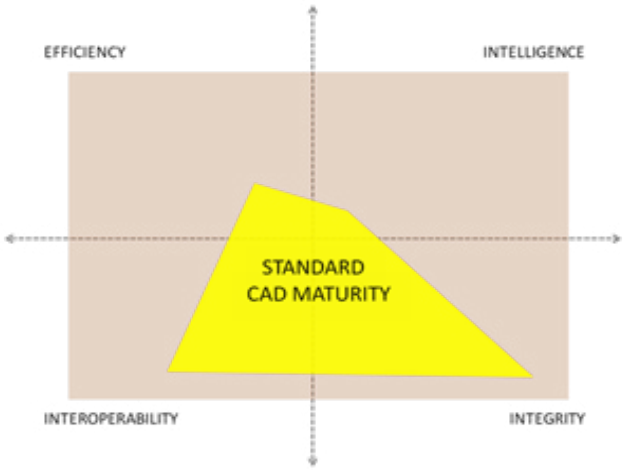
4. **Intelligence:** the amount of intelligence in the model. This requires the availability of certain data in the criterion integrity and data for each design element and metadata which can help in making analysis for the project in any stage of design, construction or operation stages. Intelligence is the real criterion that distinguish BIM models from other models that depend only on presentation.

The following are the four criteria diagrams and the maturity level is the areas that covered in each box and these areas shows the strength and weakness in each criterion.



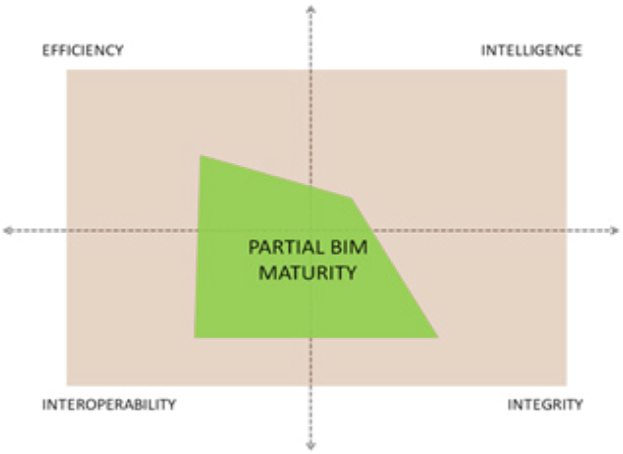
Quadrant model

Example 1



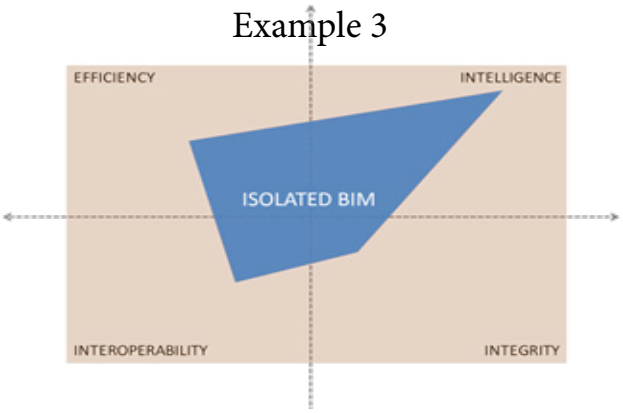
This example is compatible with the work environment using CAD technique, in which integration criterion is considered good. That's because mostly all concerned parties use CAD and exchange information easily. But what about intelligence criterion?! Frequently the model doesn't include metadata or details for its elements. Also this applies to efficiency criterion, because model production and data extraction are slow or sometimes unavailable. That's why BIM maturity level is considered low. But also integration and interoperability properties cannot be overlooked and solutions can be adopted to increase those two criteria.

Example 2



This example illustrates the use of BIM just for the purpose of presentation or clash detection where the most concern is on the visual side of the design without taking into account data and specification for the different design elements. That's why this is considered incomplete BIM maturity and this is the most common cases in the field.

Example 3



The third case represent the separate design for each system of model systems without any element of integration and ineroperability. The design is separate for each network then combined in later steps, which mean that architect, for example, do the design without considering the limits and geographical site, the network designer do the design without any coordination or follow up in all stages with other systems, or the lack of coordination between the contractor, supplier, and administration during construction phase. And there are also many examples where lack of coordination can affect BIM maturity and therefore affect the project execution plan. Though sufficiency of model data and design strength on system level or one network, the integrated model can have a lot of problems due to the lack of interaction and unsolved clashes between systems. That's why considered isolated BIM and isolation don't help in applying BIM which mainly based on interaction and coordination.

Quantitative assessment for BIM maturity levels according to quadrant model:

In BIM maturity levels model according to the mentioned model in PAS1192-2:2013, the maturity levels were divided into four levels from 0 to 3. But if we try to apply the case to the quadrant model, it will be a bit different.

Quantitative assessment in the case of the quadrant model depends on the capability of completing each criterion of maturity criteria. For example, if the completing percentage for intelligence is 50%, Interoperability is 60%, efficiency 70%, and integrity 60%, so the maturity level will be measured by taking the average of these percentages which will be 60% but there are two challenges that are considered in this assumption;

- Quantification / scoring criteria: which means what is the base of setting 50, 60, and 70%? What is the elements of assessment and what is the amount for each element?

- Secondly, the weight of each criterion. For example we cannot suppose that interoperability is measured in the same quantity as intelligence is measured. So there is a possibility of having different percentages for each criterion depending on many factors like the project quality, model requirements, available techniques, and others. For example, in one project the interest in integrity criterion is more than the interest in intelligence criterion or interoperability is more important than efficiency. I know the topic become more complex!

Now the case seems more difficult! It is already so because maturity level is not easy to say that this company in the first level of BIM maturity or that contractor is in the second level. The current classification is considered so basic which doesn't show the reality. And the assessment of maturity level is so important, where the assessment of BIM capability for all the project parties become main tasks and there are clear steps for doing BIM assessment so the case must be more precise than just a study and analysis.

Currently, I am near the end of setting a concept for quantitative assessment of quadrant model which will be explained in later editions.

Approaches for Assessing BIM Adoption in Countries: a Comparative Study within Qatar

Written by:
Mohamad Kassem

Translated by:
Mohamad Kassem

Abstract

The adoption of Building Information Modelling (BIM) is now examined at different scales ranging from organisations, through supply chains, and across whole countries and markets. For the assessment of BIM adoption at country and market scale, two main approaches are being utilised. The first traditional approach utilises a survey of industry stakeholders operating within a defined market/country to assess BIM diffusion. The second emerging approach adopts specialised macro BIM adoption models and metrics. In this paper, we aim to apply and compare these two approaches for investigating BIM adoption within Qatar.

In the implementation of the survey approach, we selected key client, contractor and consultant organisations and conducted 28 face-to-face interviews in an attempt to overcome some of typical limitations that might occur in traditional survey-based approaches (e.g. unknown and biased population). The obtained results included: BIM is increasingly specified by clients on large construction projects; BIM experience has become part of the pre-qualification criteria; traditional Design Bid & Build (DBB) is the predominant procurement route with an increasing use of the Design & Build (DB); lack of national BIM standards or guidelines and adoption of a combination of UK and US standards. Although these results provide a general understanding of the BIM landscape in Qatar, they remain qualitative and not actionable for policy makers, e.g. for developing BIM adoption strategies. Then, we applied two specialised macro BIM adoption models – i.e. Diffusion Areas model and Macro-Maturity component model developed by Succar and Kassem (2015).

This second approach was capable of providing a rating of the different areas of BIM

diffusion and a holistic discovery assessment of the country BIM maturity. Using the same approach , the results from Qatar can be benchmarked against those of a target country and can be utilised to inform a Qatari-specific BIM adoption policy. Based on this result, the research concluded that new approaches such as the macro BIM maturity approaches should be increasingly encouraged and used to complement the traditional market BIM surveys.

Keywords: BIM, Diffusion Areas, Macro BIM adoption, Macro Maturity Components.

1- Introduction

Building Information Modelling is now widely acknowledged as a revolutionary change in the technologies, processes and policies underlying the Design, Construction and Operation (DCO) industry. BIM transformative impact on the DCO industry includes a technological and procedural shift (Succar, 2009; Eastman et al., 2011). It is also considered a disruptive impact forcing the industry to rethink deliverables, roles and relationships (Eastman et al., 2008; Smith and Tardiff, 2009).

Following years of escalating connotation and impact of BIM, industry associations, governmental bodies and academic communities across several countries are increasingly releasing a wide variety of Noteworthy BIM Publications (NBPs) (Kassem et al., 2015). One of the NBP types are the BIM surveys that aim to assess BIM diffusion – defined as the spread of innovation adoption within a given population (Rogers et al., 2005) – within a defined market for a single discipline or across all disciplines. For example, a nationwide survey of architects, engineers, contractors, owners, manufacturers and others (facility managers, software vendors, and project managers) has been conducted in Australia (BEIIC, 2010). Similarly in the UK, the National Building Specification (NBS) conducts annual surveys of Architecture, Engineering and Construction (AEC) professionals (NBS, 2015). In North America, a survey of 582 professional was performed by McGraw-Hill Construction (2012) to assess BIM diffusion rates. These surveys often lack the support of a theoretical framework and may involve an unknown population.

This paper aims to compare the findings from two approaches for assessing market-wide BIM adoption. The first approach is the traditional survey-based approach with enhancement – selection of a known and representative sample and inclusion of all BIM fields namely, process, policy, technology and people (Vukovic et al., 2015; Kassem et al., 2013).

The second approach involves the utilisation of emerging models for assessing macro BIM adoption within a defined market. In recent years, several countries have launched their BIM adoption strategies and national initiatives. Research has responded to this need by developing specialised models that can be used to assess the market wide BIM adoption. One of the earliest studies in this domain is the one proposed by Succar and Kassem (2015). This study has developed five macro BIM adoption models, namely, these are Model A: diffusion areas, Model B: macro-maturity components, Model C: macro-diffusion dynamics; Model D: policy

actions, and Model E: macro-diffusion responsibilities. This research will implement 'Model A: Diffusion Areas' and 'Model B: macro-maturity components' and their accompanying metrics to assess BIM adoption in Qatar.

The implementation and results from both approaches, i.e. (a) the survey-based approach and (b) the specialised models for macro BIM adoption, are respectively described in the subsequent two sections.

2- Market-wide BIM Adoption: Survey-based Approach

The interviewees included stakeholders from Client (N=9; 32%), Contractor (N=5; 18%) and Consultant (N=14; 50%) organizations working on several ongoing projects in Qatar. The interviews covered four domains of interest: Policy, People, Process and Technology (Grys and Westhorpe, 2011; Kassem et al., 2014), containing a total of 18 questions/discussion topics with 36 subtopics.

The policy section of the interviews investigated project delivery methods and types of contracts used in Qatar. The people section investigated professional BIM related roles and the challenges around the availability of BIM skills and knowledge and the corresponding learning and training opportunities within the Qatari construction industry. The process section aimed to analyse topics such as the BIM requirements, availability and use of BIM execution plans, standard project phases or plan of work, the adopted Levels of Detail (LoD), and the roles and responsibilities of different stakeholders towards such process related topics. Finally, the technology section aimed to survey the BIM tools used across the project lifecycle in Qatar. The following sections highlight the results in each of the four domains of interest.

2-1 - Policy

The common two project delivery methods utilised in Qatar are Design and Build (68%)1 and the Design-Bid-Build (75%). The predominantly used contract types are FIDIC (International Federation of Consulting Engineers) contracts (68%) and American Institute of Architects (AIA) contracts (18%). Other contracts included the New Engineering Contract (NEC) (4%), Public Works Authority contracts (7%) and professional service agreements with consultants.

BIM standards are required on the majority of projects (68%) and 75% of interviewees think that BIM should be enforced on projects. The BS 1192: 2007 is the most widely used standard on projects in Qatar (61%) followed by the PAS 1192-2: 2013 (39%). Other BIM related standards identified with a lower frequency include: AEC (UK) CAD standards (AEC, 2012), AIA Integrated project delivery BIM protocol exhibit (AIA, 2008), National BIM standard (NIBS, 2012), Singapore BIM guide (BCA, 2012), BIM project execution planning by Penn State University (PSU, 2010), and the Global Sustainability Assessment System (GORD, 2014).

The majority of respondents (89%) believed that the government should be developing the required BIM standards for the industry with the participation of educational institutions and private organisations.

2-2 - People

1 Values in brackets refer to the percentage of respondents.

The BIM related roles identified within the Qatar construction industry according to the interviewees are summarised in Figure 1. Under 'other', roles including BIM project managers and BIM interface managers were mentioned by 30% of respondents. As to the sourcing and skilling up of individuals playing these BIM roles, 75% mentioned in-house training complemented with the hiring of external BIM construction in 36% of cases. The majority of respondents (96%) complained about the lack of BIM skilled professionals in their supply chains and highlighted the need for training. At the same time, 46% of respondents reported challenges facing their organisations in the development of BIM professionals – i.e. difficulty in convincing people to enrol on training courses and the availability of appropriate BIM training and learning opportunities.

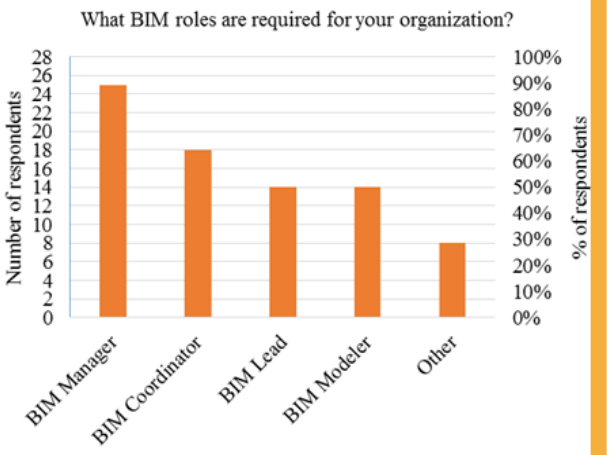


Figure 1: BIM-specific roles in Qatar

2-3 - Process

There was a unanimous agreement among all interviewees (28) that BIM is used on projects in Qatar when it is required by clients and 70% of respondents highlighted the increasing inclusion of BIM related assessment in the tender prequalification and selection process. The prevalent use of BIM, according to 75% of respondents, is the federated BIM in common data environment. The most frequently required (indicated by 64% of respondents) Level of Development (LOD) is the LOD 300. Other LOD required are LOD 100 (7%), LOD200 (18%), LOD 400 (32%) and LOD 500 (11%).

Several types and labels for the BIM documents used on project to help manage the process were identified: BIM execution plan (68%), BIM implementation plan (46%), BIM strategy (39%), modelling guidelines (36%) and 'other' documents – i.e. BIM manual, owner's guide and CAD manual - (7%). The responsibility for defining the LOD is attributed to the client (71%), the designer (29%) or the contractor (7%).

A wide variety of project stages or plan of works is adopted in Qatar including the RIBA Plan of Work (29%) and the AIA five phase of design (14%), the CIC Scope of Services and the PMI project management processes (7%). 'Other' plan of works such the BSRIA Design Framework for Building Services and client specific project phases was reported by 46% of respondents. As a consequence of these multiple project stages, interviewees reported issues such as the misinterpretation and the lack of adherence to project stages. They concurred about the need for developing standard project stages and BIM process maps for Qatar's construction industry and the joint responsibilities of government bodies, educational institutions and the private sector in this task.

2-4 - Technology

This part of the interview aimed to identify the technologies used across all phases of the project lifecycle in Qatar. A summary of the result is depicted in Figure 1. It is clear from Figure 1 that for each of the four project purposes, there is a technology that is predominantly used. This exercise was intended to inform the development of lifecycle BIM information flow which is one of the overarching goals of the funded research project. Hence, in addition to identifying the technologies used on projects, this interview part aimed to capture information about the used file exchange formats. Predominantly used exchange formats include: IFC (68%), 3D PDF (25%), COBie (21%), NWC/NWD (50%) and 'other' proprietary file formats (57%).

3- Market-wide BIM Adoption: Specialised Models

Six experts and practitioners operating in Qatar were invited to apply the two models (i.e. Model A and Model B). The experts were selected using the snowball sampling procedure. The snowball sampling procedure occurs when the researcher accesses participants through contact information that is provided by other participants (Noy, 2008). The initial subjects serve as 'seeds' through which wave 1 subjects are recruited; wave 1 subjects in turn recruit wave 2 subjects, etc. (Heckathorn, 2015). The snowball effect enabled the implementation of a non-probabilistic sampling approach. This enabled the research to start with an exploratory sample – not a representative one – that could lead to generalizable results through either (a) cumulative approach (further identification and participation of experts until data saturation, convergence or statistical validity is achieved) or (b) Delphi technique to achieve consensus about the results. In this case, the generalisation was achieved using a mini Delphi approach (a single round) where the mean, excluding the most deviating ratings from it, was circulated to all experts to achieve consensus about the measurement. The two models and the results from their applications within Qatar are described and analysed in the subsequent two sections.

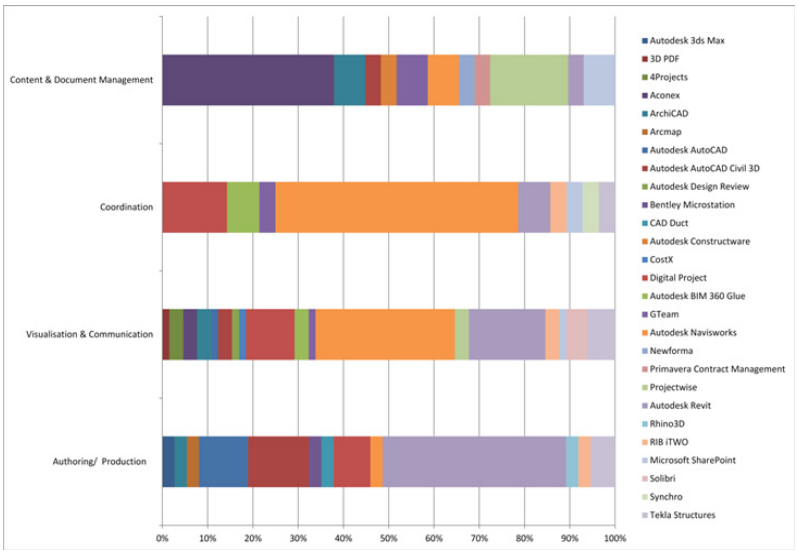


Figure 2: Technologies used on construction projects in Qatar

3-1 - Assessing the Areas of Diffusion in Qatar

The Diffusion Areas model establishes nine areas for targeted BIM diffusion analysis and planning which can be assessed independently or collectively. These nine areas of diffusion are the result of overlaying the three BIM field types (technology, process and policy) and three BIM capability stages (modelling, collaboration and integration). This model can be used to assess the extent of BIM diffusion within organisations and across markets. The six experts were asked to rate the level of each BIM diffusion area according to a five-level scale: [0] low; [1] medium-low; [2] medium; [3] medium–high; and [4] high.

Figure 3 (upper part) displays the mean for the levels of diffusion of the nine areas. The results show that all areas of diffusions, with the exception of modelling technologies, are rated below medium. This is a reasonable outcome as modelling technologies are considered one of the capability sets (software step) required to move into the first BIM capability stage – i.e. modelling stage (Succar, 2009). This result is complemented with the results obtained from the survey-based approach (Figure 2) where the spread of modelling technologies was found to be prevalent in Qatar's construction industry. This result can be better understood in the lower part of Figure 4, which aggregates the score of the three fields (i.e. policy, process, technology) for each capability stage. It shows that the highest concentration of BIM diffusion rates is in low-level modelling capabilities followed respectively by lower mid-level collaboration capabilities and high-level integration capabilities.

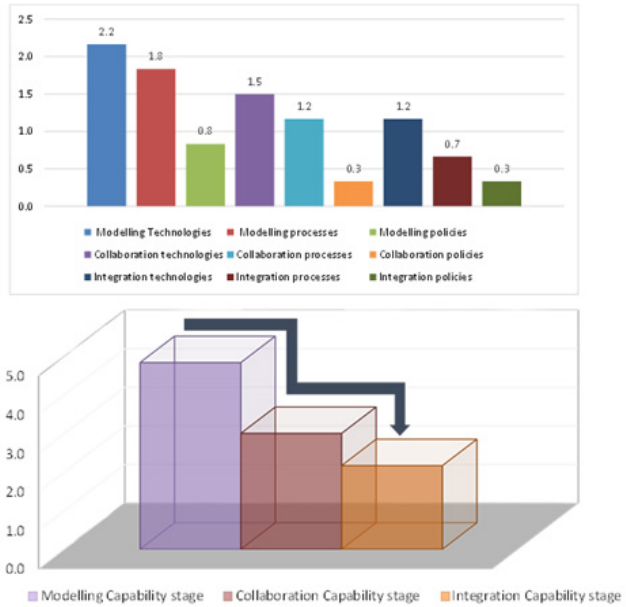


Figure 3: Assessment of BIM Diffusion Areas in Qatar

The levels of diffusion of three areas of policy (i.e. modelling policies, collaboration policies, and integration policies) are all rated below medium-low. The integration policy area has the lowest diffusion. This area refers to e.g. the rate of adoption of integrated supply-chain standards, protocols and contractual agreements; rate of proliferation of interdisciplinary educational programmes. Analysing the level of diffusion obtained for this area in conjunction with the survey results for the policy domain (Section 2.1), the result can be considered reasonable

and complementary. Indeed, the survey showed the lack of Qatari specific collaboration protocols and the simultaneous coexistence of several standards and protocols within Qatar leading to misapprehension among organisations of the supply chain. Similarly, the results for the three process related areas of diffusions (i.e. modelling processes, collaboration processes and integration processes) are complementary and congruent between the survey and the Diffusion Area model.

There are key differences between the two approaches. Despite the adequate design and structuring of the survey into topics (i.e. people, process, policy and technology), the survey results can be used only for a general understanding or a situational analysis of a market. Indeed, they do not differentiate or recognise the different BIM capabilities that coexist within a market as demonstrated by the Diffusion Areas model and consequently, they are unable to provide a corresponding assessment of such areas. Moreover, the results from the survey are not actionable by policy makers interested in targeting a specific BIM diffusion area (e.g. achieve a high diffusion level in collaborative technologies). The Diffusion Areas model provides such capabilities through the generation of targeted ratings for comparative market analysis.

3-2- Assessing the Macro-BIM Maturity of Qatar

The second model (Model B: Macro-maturity components) identifies eight components that must be measured and compared in order to establish the BIM maturity of a market (Figure 4). These eight components are: 1. Objectives, stages and milestones, 2. Champions and drivers, 3. Regulatory framework, 4. Noteworthy publications, 5. Learning and education, 6. Measurements and benchmarks, 7. Standardised parts and deliverables, and 8. Technology infrastructure. These components are assessed using the BIM Maturity Index (BIMMI) which includes five maturity levels: [a] Ad-hoc or low maturity (0); [b] Defined or medium–low maturity (1); [c] Managed or medium maturity (2); [d] Integrated or medium–high maturity (3); and [e] Optimised or high maturity (5) (Succar, 2010). The assessment can be made holistically (low detail discovery assessment) or granularly (higher detail evaluation assessment). The discovery assessment is beneficial for comparing the relative maturity for each macro-component against the other seven components; while 'evaluation' assessment enable the detailed analysis of each component using specialised metrics applicable to that component only (Succar and Kassem, 2015).

Figure 6 reports the assessment result for the eight components. The maturity of all macro components in Qatar, with the exception of the 'technology infrastructure', falls within the interval 'low' and 'medium-low'. 'Learning and Education' and 'Measurements and Benchmarks' have the lowest maturity rating. While the survey did not provide distinct components and metrics for their assessment, some of its qualitative results (e.g. limited training and learning opportunities, lack of country specific standards and protocols) support the assessment conducted using the macro maturity component. From the comparison of the application and results from both approaches (i.e. survey based and Macro-Maturity Components model), key advantages that can be attributed to the macro maturity model are: (a) it identifies and measures eight distinct but complementary components underpinning the BIM maturity of

a market; (b) Improvement targets, in terms of maturity level, can be set for each of the eight components, and (c) Can promote learning in policy development and implementation for each of the eight components. For example, targets can be established against the other markets when new markets are added to the assessment and benchmark (e.g. benchmark countries 1 and 2 in Figure 5). Countries 1 and 2 in Figure 6 are two hypothetical markets that are used as a benchmark for Qatar. Using this outcome, Qatar can set performance targets across the eight components and learn from countries that achieved relatively high maturities in such components compared to the others (e.g. noteworthy Publications form Country 2, Regulatory Framework from Country 1).

4- Conclusions

This research aimed to apply and compare two approaches for the analysis of market-wide BIM adoption: (a) the traditional survey based approach, and (b) specialised macro BIM adoption models. Both approaches were successfully implemented but the obtained results enable different understanding of market wide BIM adoption and have different practical implications.

Figure 4: Macro-Maturity Components model (Succar and Kassem, 2015)

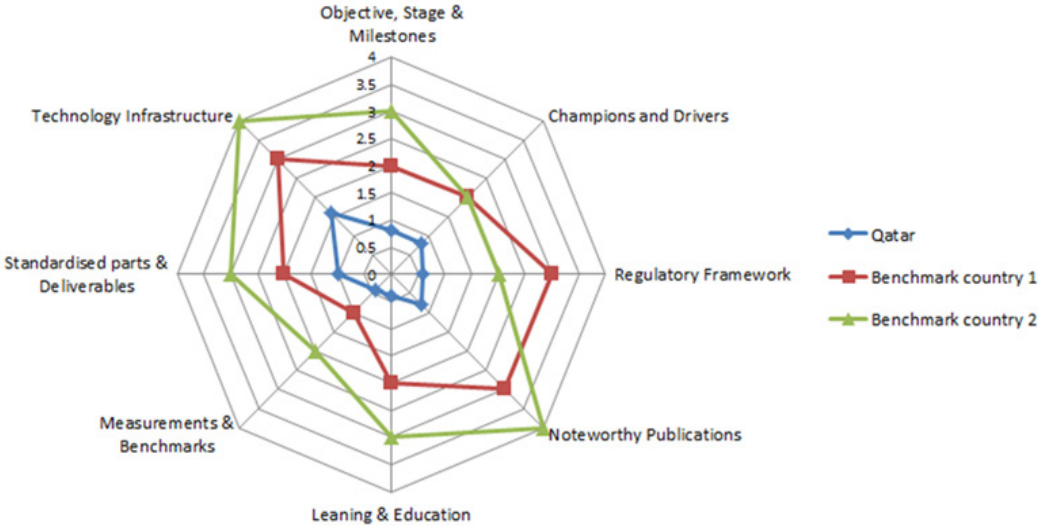


Figure 5: Rating of the eight maturity components in Qatar

The results from the survey/interview enabled an adequate general understanding of BIM adoption in Qatar. However, despite the improved structure (subdivision into topics: Technology, People, Process and Policy) and sampling methods (use of known sample of experts from key organisations operating in Qatar) of the survey/interview, the results remained descriptive and qualitative. For example, the results identified: the different BIM technologies used in Qatar; the key issues in policy domain such as the lack of country-specific standards and protocols; the limited BIM learning and training opportunities within Qatar, among others.

The application of two macro BIM adoption models – i.e. Diffusion Areas model and Macro-Maturity component model – both enabled a more informative assessment of BIM adoption in Qatar and provided results that could inform policy actions. This is the result of using specialised models, each with a specific purpose – one model to assess diffusion areas and another model to assess the macro-maturity components – and corresponding metrics. Using these models, the macro BIM adoption can be benchmarked between two or more markets. One market can set specific improvement targets corresponding to the high performance achieved within another market, hence, promoting the learning process in BIM policy development across markets.

Finally, the two approaches can be considered complementary. The results from the traditional BIM survey-based approach can be used to explain or justify the rating obtained from specialised macro BIM adoption models.

Acknowledgements

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BIM Applications in Structural Engineering

Written by: Eng / Yassen Shayah
Translated by: Youssef Elsaadouni

Summary:

In this article we will mention that using Building Information Modeling (BIM) can be a useful platform for structural engineers. An overview will be given on how to link and coordinate between architects, constructors, construction companies and connectivity with structural analysis programs such as Etabs, SAP2000 and Robot where you can evaluate, modify and re-design the model.

Introduction:

Using new methods and software is one of the most important tools that benefit structural engineers so they always look for new methods to achieve economy, safety and coordination.

BIM is capable of containing all information which is related to the project and linking all disciplines to make integrated model.

Structural engineers can benefit from BIM in different ways, as a model that can update Constantly with any design or changes in general specifications and save all data.

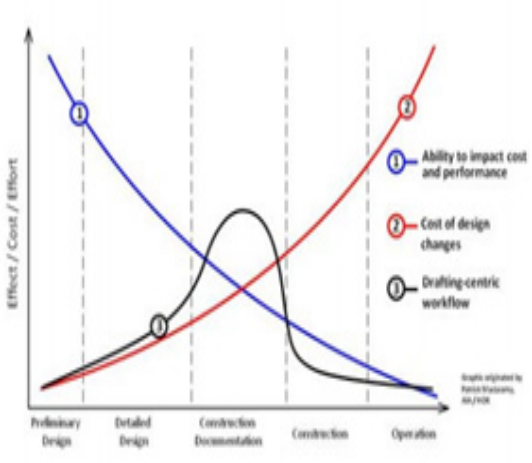
BIM is easy to handle with elements and visualize components, and also ensures lower errors and thus decrease cost of design and improve production. It also allows better analysis of alternatives through simulation.

BIM in structural engineering

To understand how BIM is applied in structural engineering, it is useful to take a look at design process in general at first which begin with the preliminary design, then move on to the detailed design, and then preparation of documents and implementation details.

Each step must be completed before next step begins and cooperation between them should be very limited.

This process works fine until we are in need to make changes in anything at any time. In this situation, we need to update and reset the steps manually.



The graph in Figure 1 shows the level of required effort over project design from the preliminary design up to completion.

The Blue line indicates the ability of structural engineer to influence project cost and performance during project life cycle, we note that it is great during the preliminary design phase, but it decreases sharply as the project progresses.

The red line shows that changes in design are cheap during the preliminary design phase, but it increases sharply throughout the project life cycle

The black line indicates the efforts made by engineers and technicians in preparing implementation details and project documents.

The first step in the structural design process is to read architectural plans that gives the structural a preliminary idea of design and assigning required data to create the analytical model to be used in structural programs to analyze according to the expected assigned loads such as Gravity loads, seismic, and wind.

Usually the preparation of documents and details of the project is synchronous with the process of analysis and design, sometimes changes will be made in structural or architectural model thus we will have several models being worked on it and several drawings containing same information for the same project, which increases required efforts to achieve coordination and congruence between them at the expense of efficiency and quality and therefore the probability of error has become very large.

For example, if a structural engineer modifies an element, and the information is not updated and synchronous with others, it affects the validity of the workflow.

While modeling using BIM, both of the physical and analytical information of the model is interlinked with each other in the same place and used in the structural analysis and production of project documents and implementation details.

Loads can be assigned to structural elements such as columns, beams and we can also enter the definition of materials properties, boundary conditions, and any important information that we need in analytical model so the structural analysis software can import the model containing all the information that we need in the analysis and design structural process.

After the analysis and design process finishes, the model and all the results can be exported such as internal forces, reinforcement, the resulting new information to be updated and automatically added to the model then instead of wasting time in redrawing new details, we have automatically updated information and adjusted quantities where we we're dealing with a three-dimensional smart model.

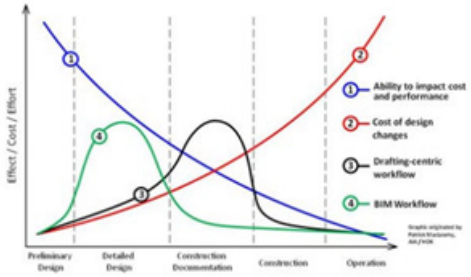
The use of BIM saves time in achieving coordination and compatibility and reduces these problems.

In BIM, the architectural plans are still the baseline reference and the first step but instead of having many models, there is only one model, an integrated model that includes both of the physical material model that gives the documentation and coordination and the analytical model that is used for structural analysis and design.

BIM facilitates the evaluation of many design alternatives that engineers can benefit from the information model to conduct simulation and analysis to reach the optimum design and the goal to achieve safety, economy and the stability of model.
With BIM, we can get all project documents such as drawings, details, quantities and any other information in the model from the preliminary design to maintenance and follow up operations.

The use of 3-D modeling and visual presentation is not new for structural designers, but the difference between BIM and traditional methods are that the design and analysis processes and the preparation of project documents are intermittent and disconnected. This makes it difficult to evaluate solutions and ineffective scenarios.

The Green Line in Figure 2 (below) shows the dynamic linking of design processes, analysis and document preparation in BIM, most of the effort in the design of the structural project has turned into the detailed design phase when the ability to influence performance



of the project is high and the cost of making changes in the design is low. This allows engineers to spend more time in evaluating several design alternatives and choosing the best choice that achieves lower time and cost in the production of documents and implementation details

Fourth dimension of BIM

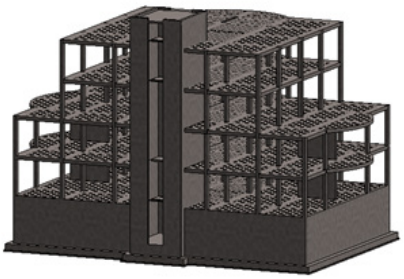
4D Modeling is Building the information model that contains the structural information of the project but takes time into consideration, to gather all the basic information that are already part of the model such as schedules, construction activities, resources, steel and concrete quantities and so on.

The properties of the model may change under the conditions of construction. it may be different from design values. The material usually changes over time and loading conditions can vary according to the stage and type of construction so the structural analysis during construction is important and necessary in new loading conditions and calculation the resistance of new elements.

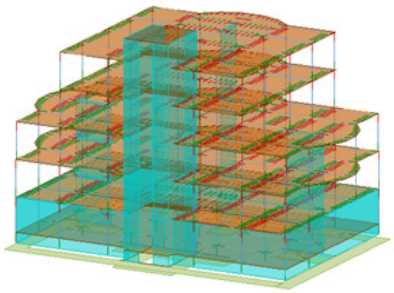
Some of our BIM projects

1. Architectural model

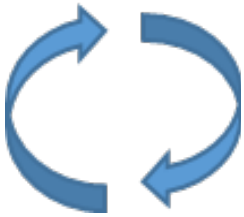
2. Structural (physical) model



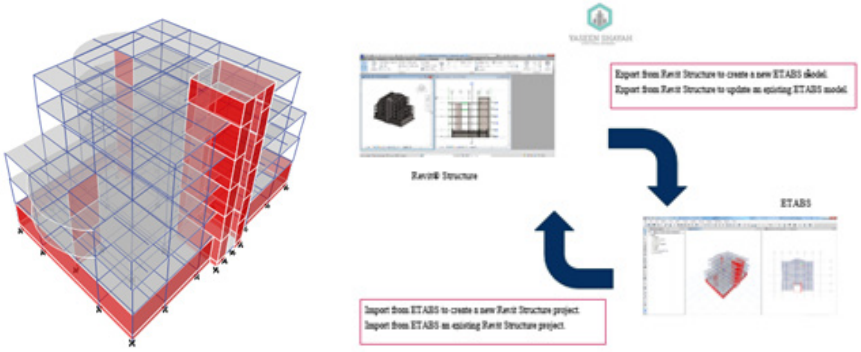
3. Analytical model



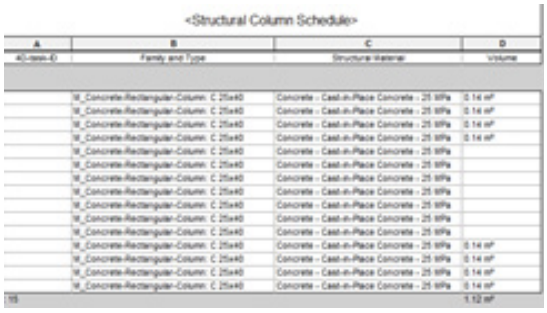
4. Export to structural analysis program(ETABS)



Clarification of import and export mechanism between Revit and ETABS



5. Preparation of project details and bill of quantity (BOQ)



Virtual Reality

By: Omar Selim

Virtual reality allows you to see a full 360 virtual modes, thanks to the head tracking system where you can feel and see as if you are moving inside the model and interact the same way you do in the real world.

Palmer Luckey, the Founder of Oculus said that virtual reality has the ability to make you do anything, anything that you would imagine you can do in the real world; In addition to many experiments that you cannot do in the real world.

You can take people from all over the world and put them in together in one imaginary room, when you reach that in the right way, you do not need to travel and burn tons of jet fuel to spin around the world. You will get rid of the need for major meetings where you consumes a lot of resources just to make people meet and talk in one room.

Virtual reality is different than reality augmented where in reality augmented the computer model is integrated with the reality we live in like to see an image for a room with imagined furniture from the internet through a mobile camera or the monster pocket game.

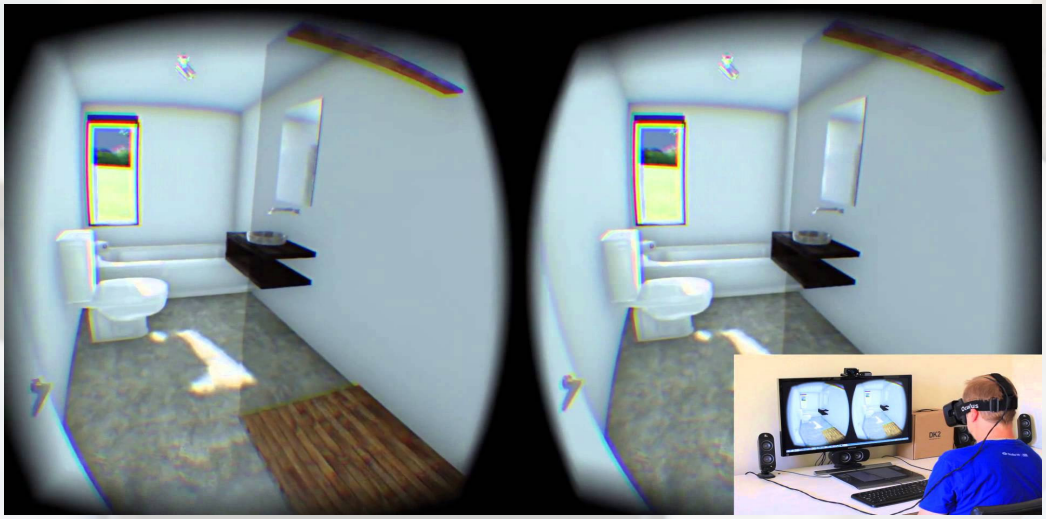
While in virtual reality you can only see the model that were designed in the computer like when you wear glasses to watch a movie as if you are participating in it or the client is watching the building ad moving through it and feels that he is really inside the building.

Virtual reality is divided in to two types in terms of the display tool:

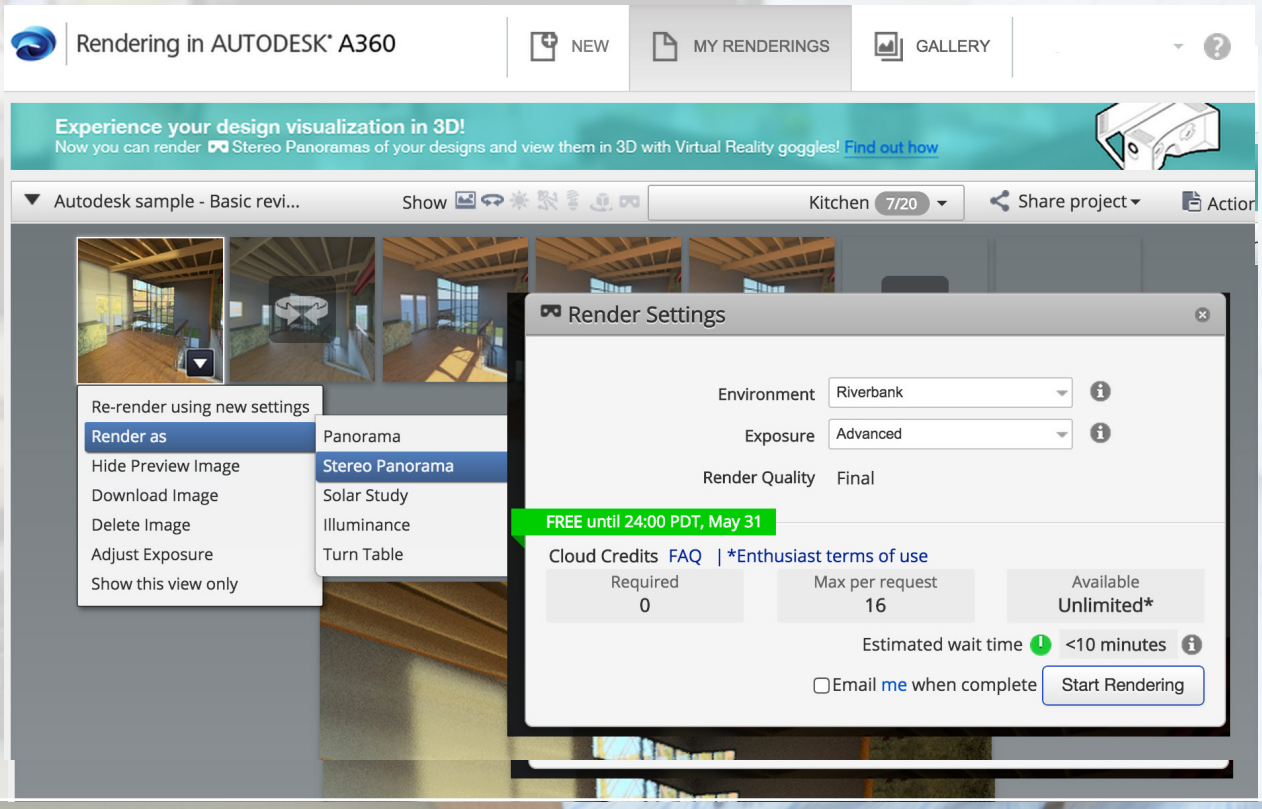
The first type is the free type, glasses for processing and display is its only tool. The other type is restricted glasses linked to monitor and computer, the advantage of the glasses in this type is that it is larger in size, expensive, and require strong equipment. Also, the restricted type features advanced sensors for tracking head and body movement compared to mobile glasses, and it is designed to work in conjunction with external cameras for more accuracy in tracking the head movement and work with physical controllers such as games paddle shifters, keyboard and other uses.

The free virtual reality type can be divided in to two types, the stand-alone type that does not need to a mobile like Vive HTC or Rift Oculus. The other type needs a mobile like Goggle cardboard.

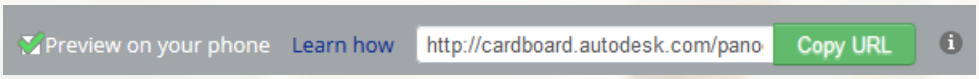
The cardboard type is too cheap, I have got one as a promotional gift in a conference. It is made of a cardboard and the processing effort is depending on the mobile device. The virtual reality is not limited to glasses but also gloves that allow you to touch things inside the model.



How to create a virtual reality???
Example 1: through Autodesk website, upload the model and choose “panorama render”
https//:rendering.360.autodesk.com/mygallery.aspx



After rendering a link will appear to you, copy this link to your mobile or your virtual reality device and start the virtual reality experience.



Example 2: export from ARCHICAD to bimx
http://www.graphisoft.com/bimx

Example 3: export any BIM model to extension fbx. Or osgb. The export to unity or vizard and turn it in o virtual reality.

Use of BIM in construction Phase: Logistic Plan

Edited by: Engr. Mohamed Hammad
Translated by: Engr. Mohamed Ghattas

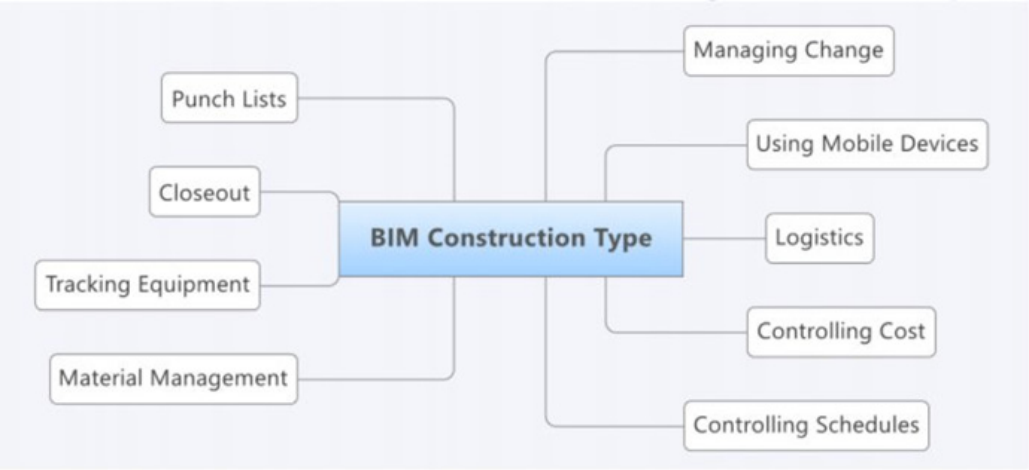
During the design stage, designers cannot predict the problems which will face the team during construction at site. Therefore, BIM should be upgraded to a second stage. BIM capability of planning and involvement of contractors and consultants has a great benefit in an environment subjected to face issues such as Logistics, Existing Conditions, Mobilization, With the improvement of site planning and site safety, the use of 3D to form the site layout and assistance in forecasting the project's cash budget and quantitative information flow.

Advantages of implementing Bim in construction phase:

- Encourages communication between technical office and site engineers.
- Enhances and strengthens the link between site planning and schedule.
- Helps to see the project before completion.
- Sets limits to the materials used in the building in terms of quantity and classification.
- Improve the ability to clarify the effective construction stages.

Bim benefits for contractors:

- Detailed information for construction, which is extracted from the model.
- Equipment and temporary facilities, such as storage stages and heavy equipment locations.
- The standard specifications for each element in the building, which must be clarified to proceed purchase order.
- Clarity of design and implementation through BIM and the ease of adding new or variable data to the elements of the building, this leads to a clear vision of the contractor and the owner of information and schedules.



Example of related construction activities to BIM
Logistics

Before starting the project, the raw materials required for the project are agreed upon as well as their purchase and delivery schedule, the plan includes agreement with the procurement department to determine the types of materials to be supplied to the project such as reinforcing steel or raw materials.

Logistics is an important knowledge area in the construction. Part of the construction process known as (MM) Material Management, it takes account of the planning, follow-up and control of logistics operations.

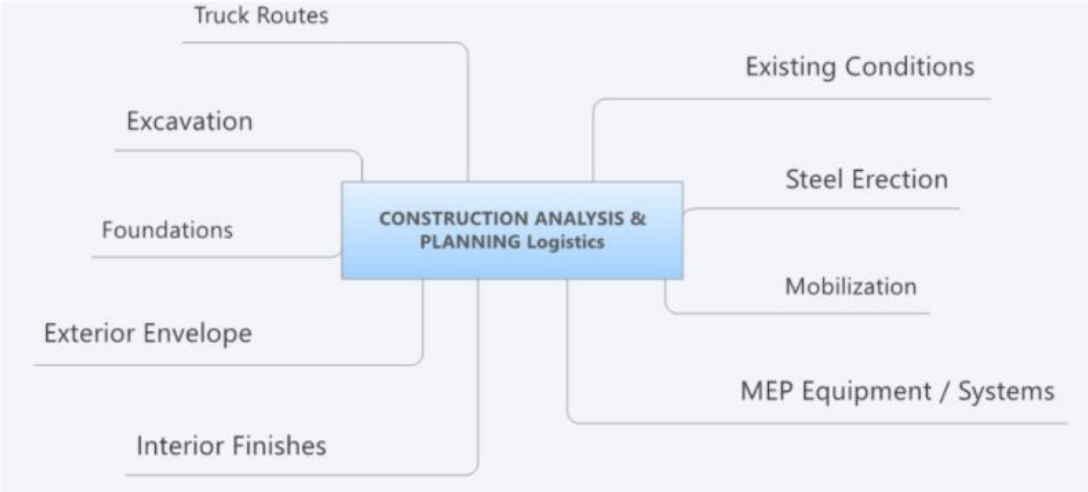
It is divided into 3 sections:

1. Purchase process.
2. Purchased material.
3. Delivery and Payment.

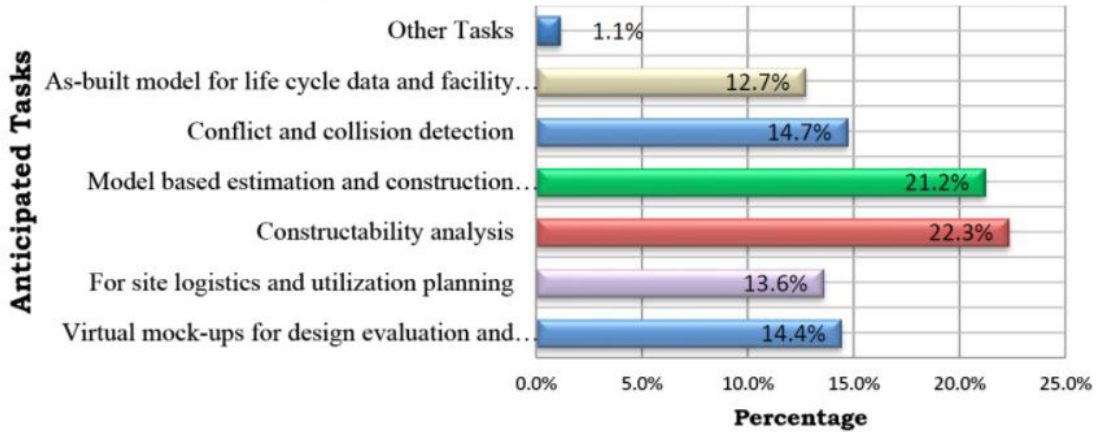
The storage process is as follows:

1. The call, depends on the delivery plan and the procurement materials and implemented through the project manager.
2. Acceptance test, determine product efficiency and ensure shipments are compliant with requirements.
3. Goods reception, search for any damage placed to the purchase and make sure it matches the delivery note.
4. Storage, reception and storage according to the specifications of the product so that no deterioration occurs.

The goal of the coordination between site and BIM model is to create a three-dimensional layout and the ability to write logistic rates, to show and present the construction units in the project safety from the garbage dumps, metal scaffolding. Usage of 3D modeling is useful to present site layout.

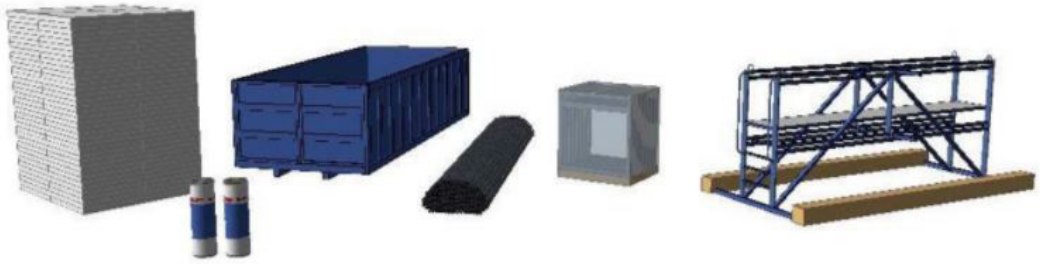


Logistic Plan



The anticipated tasks for which BIM is to be adopted

Examples of site planning objects created in the TurvaBIM-project



Examples of site planning objects created in the Turva BIM-project

Reference

1. BIM-based Site Layout and Safety Planning- VTT Symposium (Valtion Teknillinen Tutkimuskeskus) · January 2009.
2. Integration of BIM and Business Strategy- Joe Harri.

How to Choose a Successful BIM Team Members

Written By: Mohamed Abd Al Aziz Abd Al Karim

Translated By: Mohamed Ghattas

Modelers

Introduction

The creation of BIM team varies according to the nature of each project, and the needs of projects. These and many other differences determine your needs from different disciplines in the BIM team. We will discuss the basics of selecting BIM team members based on each position as mentioned earlier in the fifth issue of the magazine in the article entitled “team members roles”.
“https://issuu.com/bimarabia/docs/bim_arabia_05”.

Advice and tips:

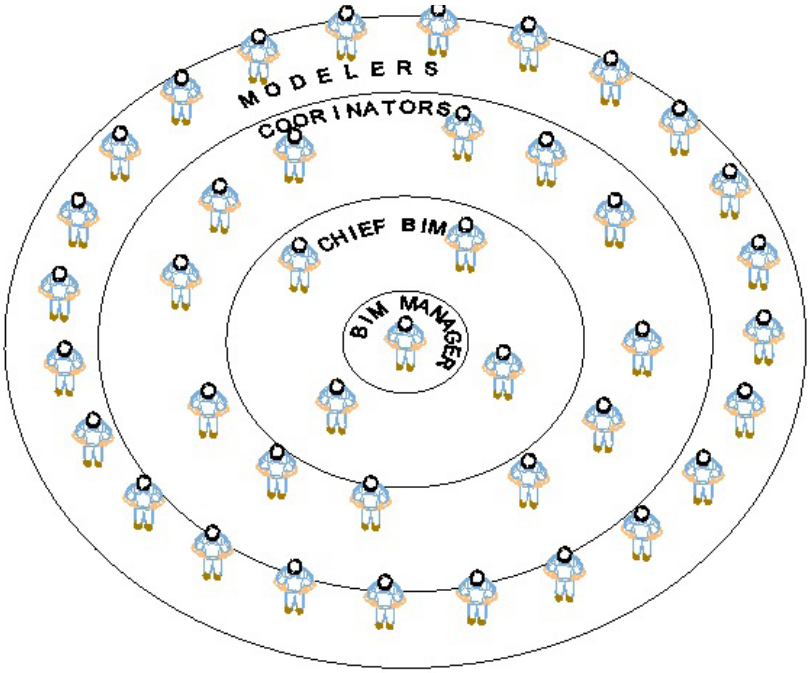
- The main objective of work is the appropriate financial equivalent to the nature of his work, so to get a team suitable for your project or your company the offered salary must suitable the skills required, the salaries of the fresh graduated is not as average experienced, nor as experts, and do not expect more value than the salary paid, hunter always fishes what suits his bait, So no need to pay extra for unneeded expertise.
- Determine the nature of work and job requirements accurately during the work announcement.
- Expect candidates who overstating their qualifications and skills.
- Check all CVs for the required skills and do not waste your time on interviewee unsuitable candidates.
- Avoid choosing the unstable person who transfers between companies, this often will not last with your company for a long time.
- Classify CVs as acceptable or unacceptable, and always choose a large number than the required because not all candidates will agree to the conditions of work or salary.
- During the interview avoid yes or no questions to avoid answers that depend on luck, and give yourself an opportunity to discover the level of knowledge through his speech.
- Test the candidates for what is mentioned in his CV and validate his experience and knowledge.
- Do not accept the liar in your team because you will take only lies that destroy your work and your credibility with those responsible for you, but differentiate between the liar and those who evaluate himself more than its worth, the latter is not a liar.
- In accordance with the position requirements (Modeler or BIM manager), expect to interviewee those who are not fluent in speech or not good to present themselves to you, or confused, so make them feel comfortable and make your words reassuring them, and then ask your questions and complete the test, maybe he will be an active and productive member of your group. If the nature of his work is to attend meetings and discussions, be sure during the interview that he is able to control the dialogue and discussions for the benefits of the company, and the ability to communicate his ideas to those around him.
- BIM is a practical field, so add a practical test with the theoretical interview for each discipline and I will try to enclose a test form or outline to prepare as much test as possible for most disciplines for the BIM team.
- Although you are choosing the best candidates because you have the authority, but you are now one of the reasons for the livelihood of one of them, and remember that ALLAH is giving white, black, the believer and the infidel, so do not select racially and do not put yourself in the place of ALLAH. You only giving advice to your company that your choice is appropriate for the nature of the work, as per narrated from Prophet Mohamed peace be upon him through Tamim ibn Aws: “Religion is the advice, we said: to who, He said: To ALLAH, his Book, his Messenger, the Muslims imams and to their nation”.
- Sometimes, the unselected candidate may call you, or meet you by accident, or someone in your company associates you, humble yourself to ALLHA and do not be arrogant in your

response to him. Let your intention in your words be pure advice and address the missing points that the company does not have. And remember that you are treating ALLAH in your treatment of people.

- These were general advice, you may find more with the specialists in human recruitment, and you should check them.

- As I mentioned earlier, we will discuss the basics of selecting BIM team members based on each position as mentioned earlier in the fifth issue of the magazine in the article entitled "team members roles". "https://issuu.com/bimarabia/docs/bim_arabia_05".

1. Modelers



Modelers also known in cad environment as draftsmen, who are responsible for model implementation using different software for each discipline (architectural, structural, and electromechanical), they became coordinators when their experience increases.
Here I will use MEP modelers as examples.

Job Requirements:
1- Scientific qualifications:
Requires technical industry diplomas in the required specialization or higher certificate. If they received training courses from a well-known or competent parties. I was amazed while interviewing candidates trained by those who are known to me, and I knew they are not qualified to be trainers, so it is better to check the credibility of the trainers, because the weak branch does not sprout flowers.

2- Practical experience:
Of course training courses are only to open the knowledge door, but the real work gives the experience, it is important to make sure of the projects where the candidate work before, what

exactly was his role, because his previous role will be his next role with you until he gets new training for the new tasks, and since the BIM field is still limited it is easy to know each other to a certain extent, try to ask your acquaintances and colleagues about him and his efficiency, and whether he is cooperative or problematic.

3- In addition to above, there are two that skills distinguish between candidates and widening differences between them:

-First: speed, and you must make sure that his speed is suitable for your work and schedules that you need to handover work.

-Second: is the output quality, which means printing and the printing skills, converting the file format, saving and archiving the soft and hard documents. I remember while testing a draftsman using the pen plotter, in the 1980s and 1990s, the pens of the plotters draw the same line several times with the number of repetitions of these lines until the paper is torn in more than one place. Here, the intended is to monitor output quality.

Job vacancy form sample:

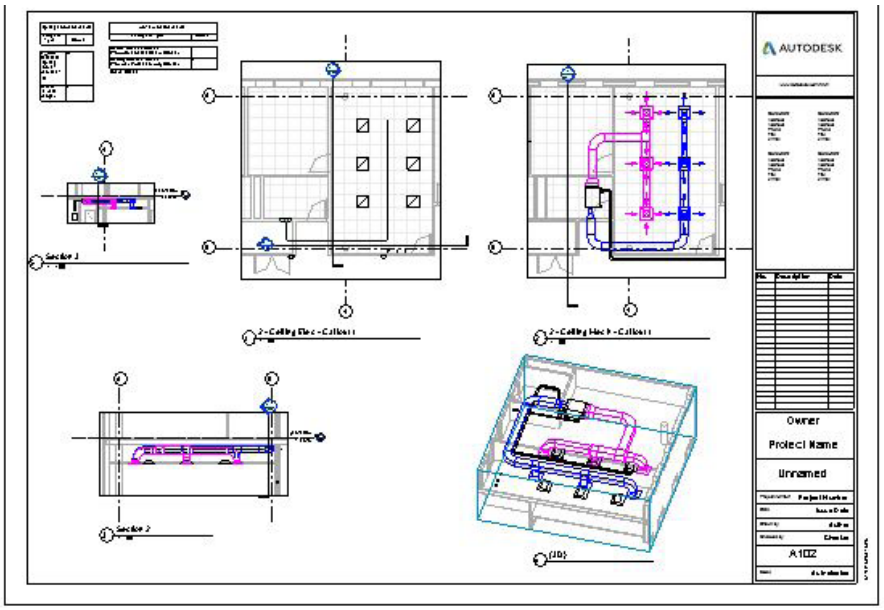
Required for (a contracting company/consultant office) electro-mechanical modelers to support the technical management in the project (___) «whether the description or name of the project» under the following conditions:

- Certificate (___) / year of graduation (___).
- Usage of software (___, ___, ___) for a period of not less than (___) years in the establishment and modification of the model files.
- Experience in the electromechanics field not less than (___) with experience in the field of between (__) and (__) years.
- Has experience certificates from previous companies or projects covering the period of experience mentioned.
- Has training certificates from accredited and recognized parties.
- Ability to read and understand electromechanical drawings.
- Has the ability to withstand various work pressures.
- Has the ability to withstand various work pressures.
- Has the ability to work, cooperate and communicate with the team.
- Has good experience in keeping and retrieving files properly and safely.
- Understanding and complying with the CAD & BIM Standards, as well as various naming systems for files, drawings, families and other elements of work. (File Naming & Convention System).
- Understanding construction and architectural works will be taken into consideration.

Responsibilities:

- Create, develop and modify model files according to project specifications and verbal

instructions written by supervisors and managers in the program mentioned.
- Completion of work (___) using (___) software.
- Printing with high quality.
- Save and retrieve files properly and safely.
- Convert files between different formats according to work needs.
- Providing the technical team and management with the required information and full cooperation with them.
- Solve the technical problems you face while you work.
- Prepare coordination reports between elements in models (Model Clash Reports) using the (___) software and solve them efficiently.
- Modification of the families and blocks if necessary.
- Follow up the work according to the project schedule.
- Report his work to his supervisor.



A sample to test and evaluate Electromechanical Modeler using Revit:

Do not forget to save your work

1. Create a new Revit file using Systems-Default_Metric (Templet).
2. Attach the Arch Link Model as an Insert Revit Link from the following path:
C: \ Program Files \ Autodesk \ Revit 2017 \ Samples.
3. Change Browser Organization views to Type / Discipline.
4. Create and label your work sets according to the usual method you previously worked on.
5. Enter the default “Levels & Views” from the architectural file that you have attached to your file and cancel the existing ones, and then rename them in the same way as you previously did in electromechanical works.
6. Save the Revit file you created in the same way you previously did it as a Central file.
7. Add Room Tag to the rooms in Level 2 between Axis A and Axis C.
8. Open View of the ceiling lighting on the second floor.
9. Go to room 229 and install the M_Plain Recessed Lighting Fixture 600x600 with 6 Units on the ceiling and then change the voltage difference from 110 to 220 volts.

10. And then attach the M_Lighting Switches on the wall next to the door and the voltage difference to 220 volts and then tie all the lighting fixtures to the switches.
11. Go to room # 227 and install the M_Lighting and Appliance Panel board - 480V MLO on the wall, then add the name EDB-N1.
12. Connect the lighting fixtures to the distribution panel board.
13. Cable Tray is installed at a height of 2800mm, 100mm wide and 50mm height, and is connected to the distribution panelboard and lied through the two lines of lighting fixtures.
14. Go to HVAC View for the 2nd Ceiling level and make sure that ceiling is displayed on that floor.
15. Go to room 229 and install the diffuser - Circular - Rectangular Neck - Ceiling Mounted by 3 units of the length of the room and the Family Return Diffuser - Hosted by 3 units of the length of the room opposite the previous family in an arrangement similar to the lighting units.
16. Go to Bathroom No. 226 and add the Fan Coil Unit - Horizontal - Belt Drive – CHW at 2500mm offset with 220 volts.
17. Create a System for Supply and Return units with the FCU and create the appropriate Duct.
18. Add two cold water pipes to the FCU which passes through the 233rd stair and then by the riser to the first floor.
19. Add ducts and pipes insulation with the thickness you have used in your previous work.
20. Connect the FCU unit to circuit number 2 on the same distribution panel board.
21. Create one callout for Ceiling Lighting View for Level 2 including rooms 226, 228 and 229.
22. Repeat Create Callout for Ceiling HVAC View for Level 2 Includes the same rooms.
23. Create vertical sections for room 229, and another section cutting bathroom number 226.
24. Add the necessary dimensions and annotations. For both electricity and air conditioning in all callouts and sections.
25. Create a 3D view of the last sections.
26. Create a schedule table for air terminals that contains family, type, and count.
27. Create a schedule table for a lighting fixture that contains family, type, and count.
28. Create a Sheet using the default settings using Title Block A1 Metric.
29. Drag the 2 callouts. 2 sections, 3D section and the 2 schedules to the new Sheet.
30. Do not forget to save your work.
31. Export your file to AutoCAD DWG format.
32. Export your file to the Navisworks format.
33. Export your file to PDF format in the right way and as you used to do in your previous works.
34. Print the sheet you created.
35. Detect clashes and print the report.

Test finish

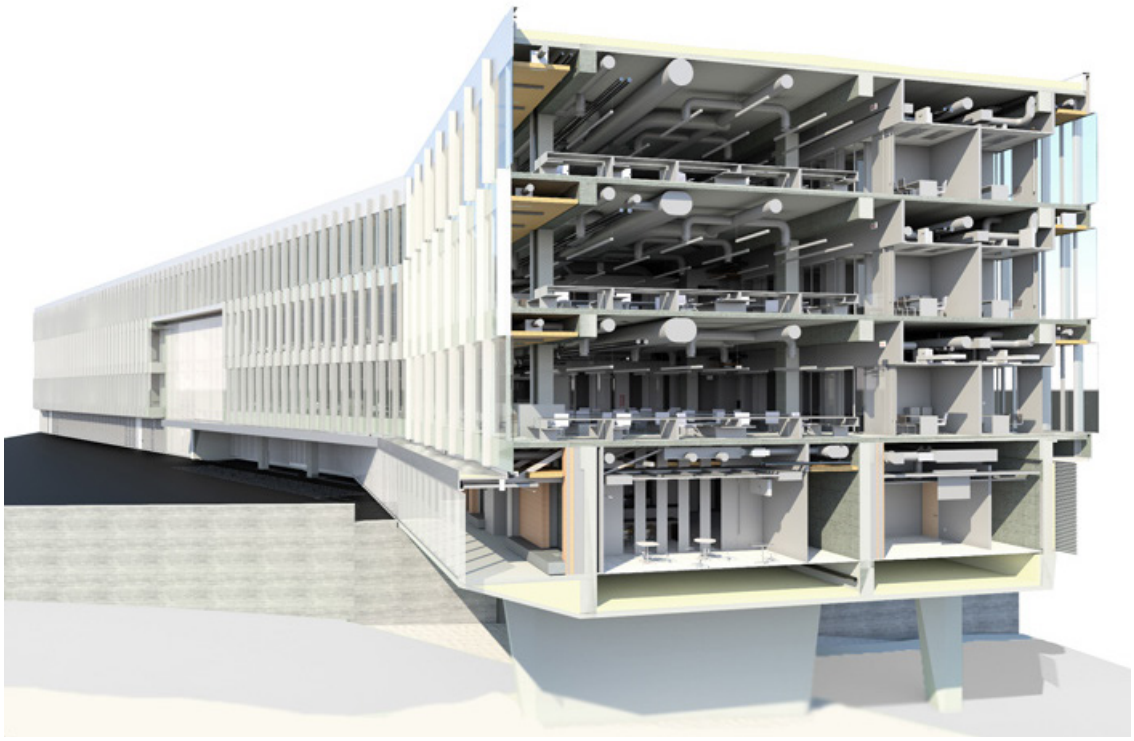
- I will leave the assessment of the results to you, according to the need of your company or your project of the required modeling skills. The attached picture is not the ideal result, but we generally indicate the ability to execute these commands easily, this test requires two to three hours from the average experienced modeler, ask the candidate to ask you if any ambiguity they faced, to save your and his time, and does not waste his time in unrequired improvements, as he is accountable for the time. It is best not to set a final time for the test but advise him to take time into consideration.
- The selection of BIM team members to be continued in the future issues.

BIM importance in Projects Coordination

Written By: Ammar Al Tom

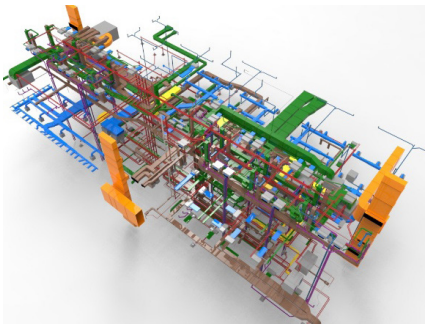
Translated By: Mohamed Ghattas

The pace of projects today is very fast and everyone is united in this industry to find new and innovative ways to implement projects. Building Information Modeling (BIM) has emerged, and the project delivery process enables employers, contractors, consultants and other stakeholders to visualize and understand the evolution of the designs and problems as never before. The design and construction process can be improved by enabling early detection and resolving coordination problems detecting conflicts (Clash Detection), which has become the leading feature of the application of the (BIM) in addition to the subject of inventory quantities accurately.



The management of virtual model development requires similar skills to real construction management, Project that intends to exploit the benefits of BIM needs a manager and a multidisciplinary team working with the parties that contribute to the model. The team can incorporate graphics from other entities such as subcontractors and manufacturers into a full model and detect conflicts.

BIM enhances the confidence earlier, before starting construction there is an opportunity to allocate a model space for each subcontractor or supplier to give their opinions on the modeling process and to resolve system conflicts before construction starts.



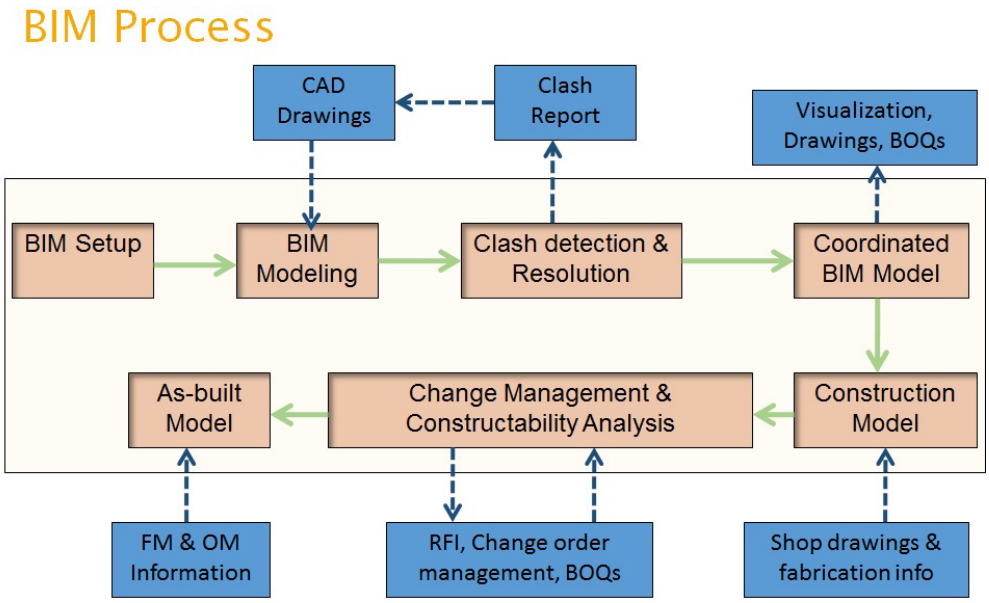
Clash Detection

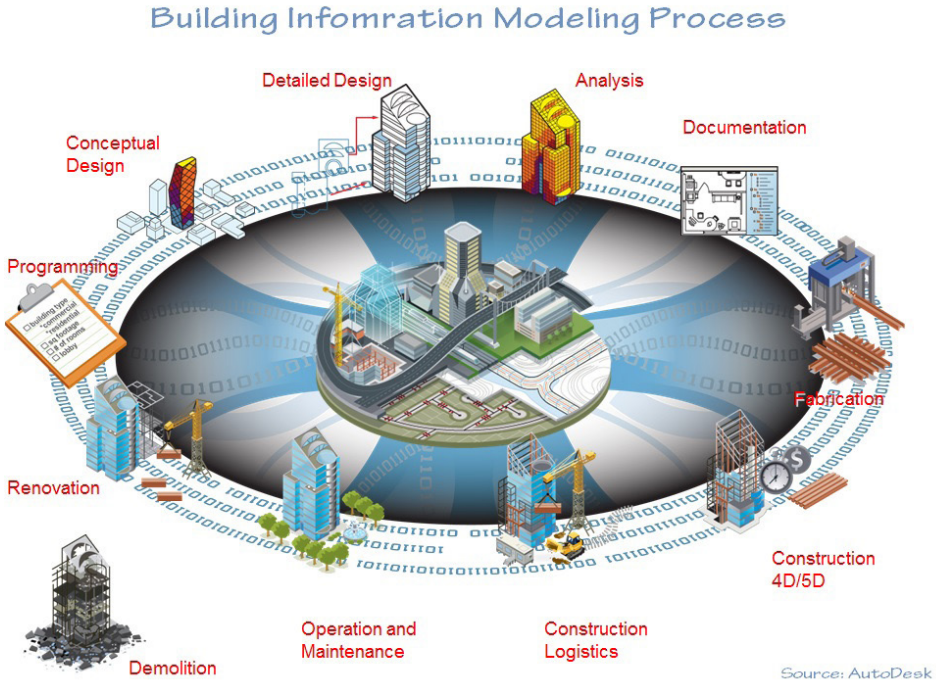
Projects generally involve complex interactions between architectural, structural or electromechanical sections. BIM creates a single virtual model for a project by merging all into one model, a comprehensive and systematic review is performed, the results are presented to team members where problems can be reviewed and resolved, thus solving coordination issues early, at some point where the risks of serious errors in the site can be avoided and the consequences will be dire.

BIM coordinated Model

There are stages to build clash free model that begin with the conversion of CAD drawings to a model that is often recommended for LOD200 or LOD300 to be more realistic than the design model. Then perform clash detection using Navisworks software, which develops a model status report either negative and can be modified on the model, or a positive report which can be used in presentations to owners and export coordinated drawings.

While construction, stages continue to develop a model for the contractor including all the drawings and details from sub-contractors and suppliers until the completion of the model, all these stages can be clarified as below:





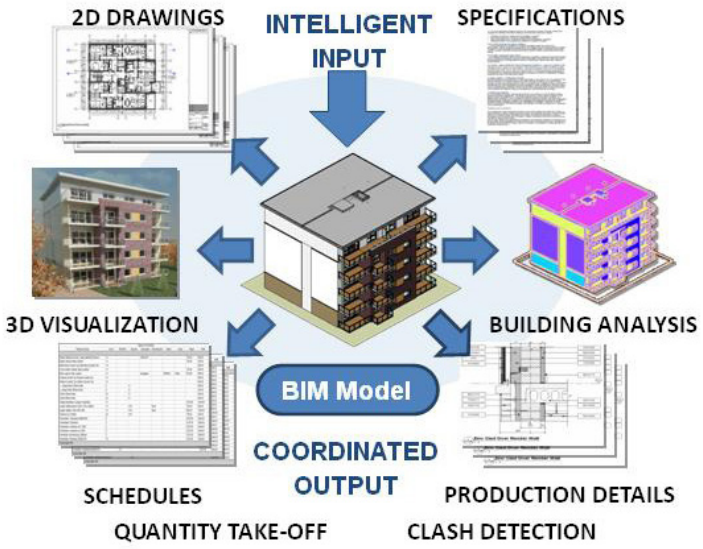
BIM project coordination benefits:

- Develop a real construction project through a model.

- Reduce conflicts between different departments. Which significantly reduces RFI compared to traditional ways.

- View building from different angles.

- Increase productivity at the site.
- Low construction cost.
- Reduce construction time.
- Export more accurate drawings than before.



Team competencies required for the coordination process:

- Ability to deal with people and project challenges.
- Ability to deal with the model, navigation, and review.
- Learn the BIM model applications.
- Knowledge of building systems.

Thus, the individual face a challenge that paves the way for all complex construction solutions that consume a lot of time and effort as well as problems between the parties to the contract.

Reader's Messages

Readers' messages are considered lighthouses that show us which topics we have to prepare for the next edition of our magazine and what our readers are interested in. so we are welcoming your messages, advices, and any criticism. And one of the messages received and made us happy is the message from Eng. Wissam Ahmed
"BIM is 10% technology and 90% sociology"

A famous phrase by Simpson Scott, the principal of American Institute of Management (AIA)
Actually, I found this sentence to be the most useful guide that explain BIM... because its working environment is based on how much cooperation of engineers is on one project and the availability of spirit of assistance and mastery without having destructive competition, the working environment in BIM forces us to interact with our colleagues at work differently. BIM main purpose is to work together for one project to be completed perfectly.
That's why we consider BIM as health, psychological and social development among the members of one team. (From the point of view of psychology). All this can affect the results of one project, so what do you think of contracting companies and their fear of applying this technology.

Surely if we knew how to communicate the concept of BIM for college students and alumni graduates and engineers who work in one office in a simple way, we can make it easier for engineers and contractors to understand and apply this technology.
As a result, they can effectively understand that this technology can really help them and that they can save time, effort and cost. Beside all of this, it can help in reducing the conflicts result from the different fields in one project by a very large rate.
Many articles you can follow through a highly respectable Arabic magazine
And here is the link... com.bimarabia: // http /
Message from Eng. Mohamed Mahmoud
Peace be upon you and best wishes for a happy new year,

I would like to thank you for the wonderful effort and inshallah always in continuous progress,

I am an architect, batch of 2012, currently working on Master which is about BIM in Faculty of Fine Arts Department of architecture. And really there is not a written book or letter that benefit me more than your magazine. Your understanding of the subject make the topic clear and simple which help anyone to understand. And using Arabic language in writing these articles is more than wonderful. I just wanted to thank you, and tell you that I am waiting for the next edition eagerly.